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# **Data Encoding Specification of i-Urban Revitalization**

**- Urban Planning ADE -**

**ver.1.3**



# Contents

|  |    |
|--|----|
| Introduction.....  | v  |
| Part 1. Urban Object Data Encoding Specification .....         | 1  |
| 1. Scope .....   | 1  |
| 2. Normative references .....                                  | 1  |
| 3. Conventions .....   | 1  |
| 3.1 Terms and definitions.....                                 | 1  |
| 3.2 Abbreviated terms .....                                    | 1  |
| 4. Urban Object Data Encoding.....                             | 1  |
| 4.1 Overview.....  | 1  |
| 4.2 Object definition .....                                    | 2  |
| 4.2.1 Extended properties of Building.....                     | 2  |
| 4.2.2 Extended properties of LandUse.....                      | 6  |
| 4.2.3 Extended properties of Transportation .....              | 7  |
| 4.2.4 Extended properties of CityObjectGroup.....              | 9  |
| Annex A (normative) XMLSchema Definition.....                  | 11 |
| A.1 XMLSchema .....  | 11 |
| A.2 Sample data (informative) .....                            | 13 |
| Annex B (informative) Code lists for Urban Object Data.....    | 17 |
| Part 2. Urban Function Data Encoding Specification .....       | 21 |
| 1. Scope .....   | 21 |
| 2. Normative references .....                                  | 21 |
| 3. Conventions .....   | 21 |
| 3.1 Terms and definitions.....                                 | 21 |
| 3.2 Abbreviated terms .....                                    | 21 |
| 4. Urban Function Data Encoding.....                           | 21 |
| 4.1 Overview.....  | 21 |
| 4.2 Object definition .....                                    | 22 |
| 4.2.1 UrbanFunctionType, _UrbanFunction.....                   | 22 |
| 4.2.2 LegalGroundsType .....                                   | 24 |
| 4.2.3 AdministrationType, Administration .....                 | 26 |
| 4.2.4 ZoneType, _Zone .....                                    | 26 |
| 4.2.5 LandUsePlanType, LandUsePlan .....                       | 27 |
| 4.2.6 UrbanPlanType, UrbanPlan.....                            | 27 |
| 4.2.7 AgreementType, Agreement .....                           | 28 |
| 4.2.8 RegulationType, Regulation .....                         | 28 |
| 4.2.9 DevelopmentProjectType, DevelopmentProject .....         | 28 |
| 4.2.10 AreaClassificationType, AreaClassification .....        | 29 |
| 4.2.11 DistrictsAndZonesType, DistrictsAndZones.....           | 29 |
| 4.2.12 CensusBlockType, CensusBlock.....                       | 30 |
| 4.2.13 DisasterDamageType, DisasterDamage .....                | 31 |
| 4.2.14 PollutionType, Pollution.....                           | 31 |
| 4.2.15 DisasterPreventionBaseType, DisasterPreventionBase..... | 32 |
| 4.2.16 RecreationsType, Recreations.....                       | 32 |
| 4.2.17 HubCityType, HubCity.....                               | 33 |
| 4.2.18 LandUseDiversionType, LandUseDiversion .....            | 33 |

|  |    |
|--|----|
| 4.2.19 UrbanizationType, Urbanization .....  | 34 |
| 4.2.20 PublicTransitType, PublicTransit .....  | 34 |
| Annex A (normative) XMLSchema Definition .....                                       | 35 |
| A.1 XMLSchema .....  | 35 |
| A.2 Sample data (informative) .....  | 44 |
| Annex B (informative) Code lists for Urban Function Data .....                       | 46 |
| Part 3. Statistical Grid Data Encoding Specification .....                           | 51 |
| 1. Scope .....   | 51 |
| 2. Normative references .....  | 51 |
| 3. Conventions .....   | 51 |
| 3.1 Terms and definitions .....  | 51 |
| 3.2 Abbreviated terms .....  | 51 |
| 4. Statistical Grid Data Encoding .....  | 51 |
| 4.1 Overview .....   | 51 |
| 4.2 Object definition .....  | 53 |
| 4.2.1 StatisticalGridType, _StatisticalGrid .....                                    | 53 |
| 4.2.2 PopulationType, Population .....   | 55 |
| 4.2.3 PublicTransportationAccessibilityType, PublicTransportationAccessibility ..... | 57 |
| 4.2.4 LandPriceType, LandPrice .....   | 57 |
| 4.2.5 LandUseDiversionType, LandUseDiversion .....                                   | 58 |
| 4.2.6 HouseholdsType, Households .....   | 59 |
| 4.2.7 OfficesAndEmployeesType, OfficesAndEmployees .....                             | 60 |
| Annex A (normative) XMLSchema Definition .....                                       | 62 |
| A.1 XMLSchema .....  | 62 |
| A.2 Sample data (informative) .....  | 67 |
| Annex B (informative) Code lists for Statistical Grid Data .....                     | 70 |
| Bibliography .....   | 72 |
| Revision History .....   | 73 |

## Introduction

Urban planning has been contributing to the formation of healthy urban environments, preventing disorganized urban sprawl and encouraging infrastructure development in Japan. However, urban areas in Japan, which is facing depopulation and aging society, are at a big turning point. New social issues such as a rapid increase of empty apartments and lands, and non-universal design of facilities lie heavily on their sustainable development, especially regional area. Efficient urban management is required, and municipalities recognize the significance and importance of compact urban development from the perspective of administrative costs.

From this kind of circumstance, the Japanese government strongly promotes i) formation of a high-quality urban revitalization project for regional hub cities, ii) consensus building among those concerned, and iii) investor's understanding, according to the concepts "*Selection and Concentration*" and "*Respect for Local Intention*".

Recently, the investment climate has changed dramatically with the expansion of the Internet and the development of information communication technologies such as "Fin-Tech". Information-intensive activities are very important to call for investment.

The "i-UR" is an information infrastructure for urban revitalization. It allows people to analyse and to visualize the situation and problems of urban areas according to the future vision of each area using geospatial information and virtual reality technologies. The quantitative analysis and visualization clearly show the cash-flow and spatial plan of the city and promotes understanding and encourages consensus building among relevant players, e.g. investors, citizens, and developers.

This document defines the encoding specification of the data for i-UR (which is called "i-UR Data"), and aims to assist the formation of social agreement and to improve the quality of urban investment in order to contribute to urban revitalization.

The i-UR Data is the combination of following data:

- a) 3-dimentional city objects and city model
- b) Detailed information of city objects  
e.g. building structure
- c) Constraints/conditions (e.g. regulation) related to urban revitalization  
e.g. inundation hazardous areas
- d) Statistical grid data for global analysis and visualization

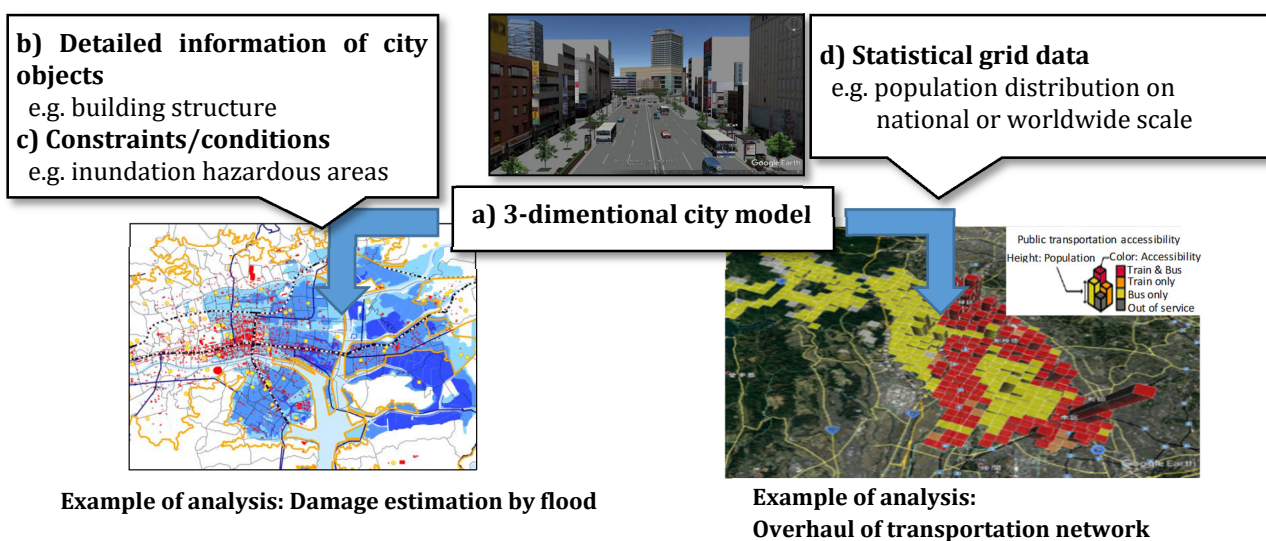


Figure 1 Structure of i-UR Data

The i-UR Data Encoding Specification targets on b) to d) data, as a) is already defined in City Geography Markup Language (CityGML). CityGML is an XML/GML based 3D data standard developed by Open Geospatial Consortium (OGC) for the representation, storage and exchange of 3D city models and is widely used in the application fields related to urban areas.

The i-UR Data Encoding Specification is composed of three parts listed below. Each encoding specification is tied up with each component and is an extension of CityGML according to the rules of the Application Domain Extensions (ADE) to ensure data interoperability. Thus i-UR Data aims to be utilized in various application fields, such as disaster prevention, tourism and to carry out urban revitalization.

**Part 1: Urban Object Data Encoding Specification**

This document targets on *b) Detailed information of city objects for analysis* and defines them as properties of CityGML object.

**Part 2: Urban Function Data Encoding Specification**

This document targets on *c) Constraints/conditions related to urban revitalization* and defines constraints and conditions as subclasses of the root class in CityGML.

**Part 3: Statistical Grid Data Encoding Specification**

This document targets on *d) Statistical grid data for global analysis and visualization*, and defines a statistical grid as subclasses of the root class in CityGML and new Levels of Detail (LOD) for a broad description of city models. CityGML already supports different LODs. LODs are required to reflect independent data collection processes with differing application requirements. This document extends LODs to describe rough city models which do not have to be detailed but should be described with a unified unit among cities. This enables users to analyse and visualise cities under the same conditions.

# Part 1. Urban Object Data Encoding Specification

## 1. Scope

Detailed information of buildings, roads, and other objects which constitute urban areas are necessary for the quantitative assessment of the current situation and problems in urban areas.

This document defines additional information of urban objects which is necessary for urban assessment as attributes of urban objects and specifies the encoding format of the information.

## 2. Normative references

Followings are normative references of this document.

- OpenGIS® OGC City Geography Markup Language (CityGML) Encoding Standard, Version 2.0, OGC document 12-019

## 3. Conventions

### 3.1 Terms and definitions

No terms and definitions are listed in this document.

### 3.2 Abbreviated terms

ADE Application Domain Extensions

CityGML City Geography Markup Language

GML Geography Markup Language

LOD Levels Of Details

OGC Open Geospatial Consortium

UML Unified Modeling Language

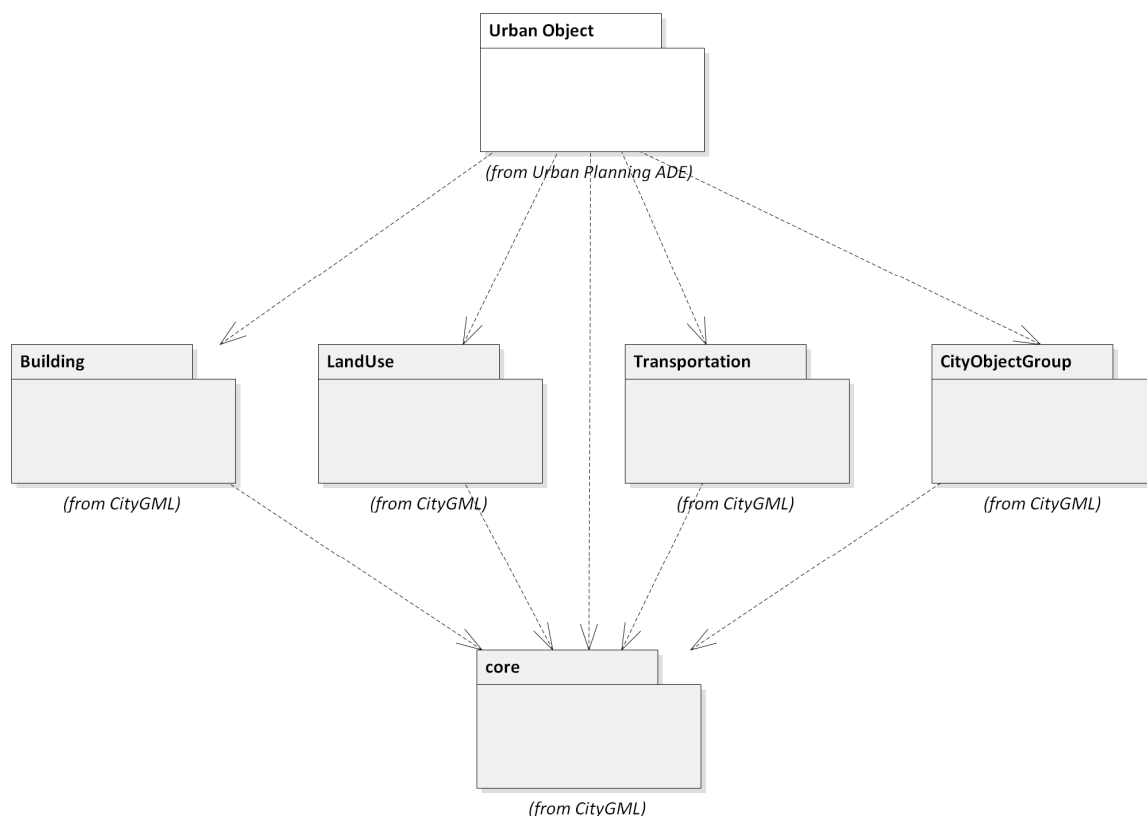
## 4. Urban Object Data Encoding

### 4.1 Overview

The Urban Object Data Encoding is an extension of CityGML. This document defines the elements and types according to the rules of the Application Domain Extensions (ADE) which are necessary for urban assessment and planning, but not defined in CityGML. Those already defined in CityGML are imported without any inconsistency.

Figure 1-1 shows the structure of Urban Object Data. The package Urban Object imports some modules defined in CityGML, including Building, LandUse, Transportation and CityObjectGroup.

Note: The CityGML extension UtilityNetwork ADE will be imported to this specification in future. The UtilityNetwork ADE defines concepts which allow for modelling different types of networks in the context of 3D city models, such as electricity, freshwater, wastewater, gas or telecommunication networks.



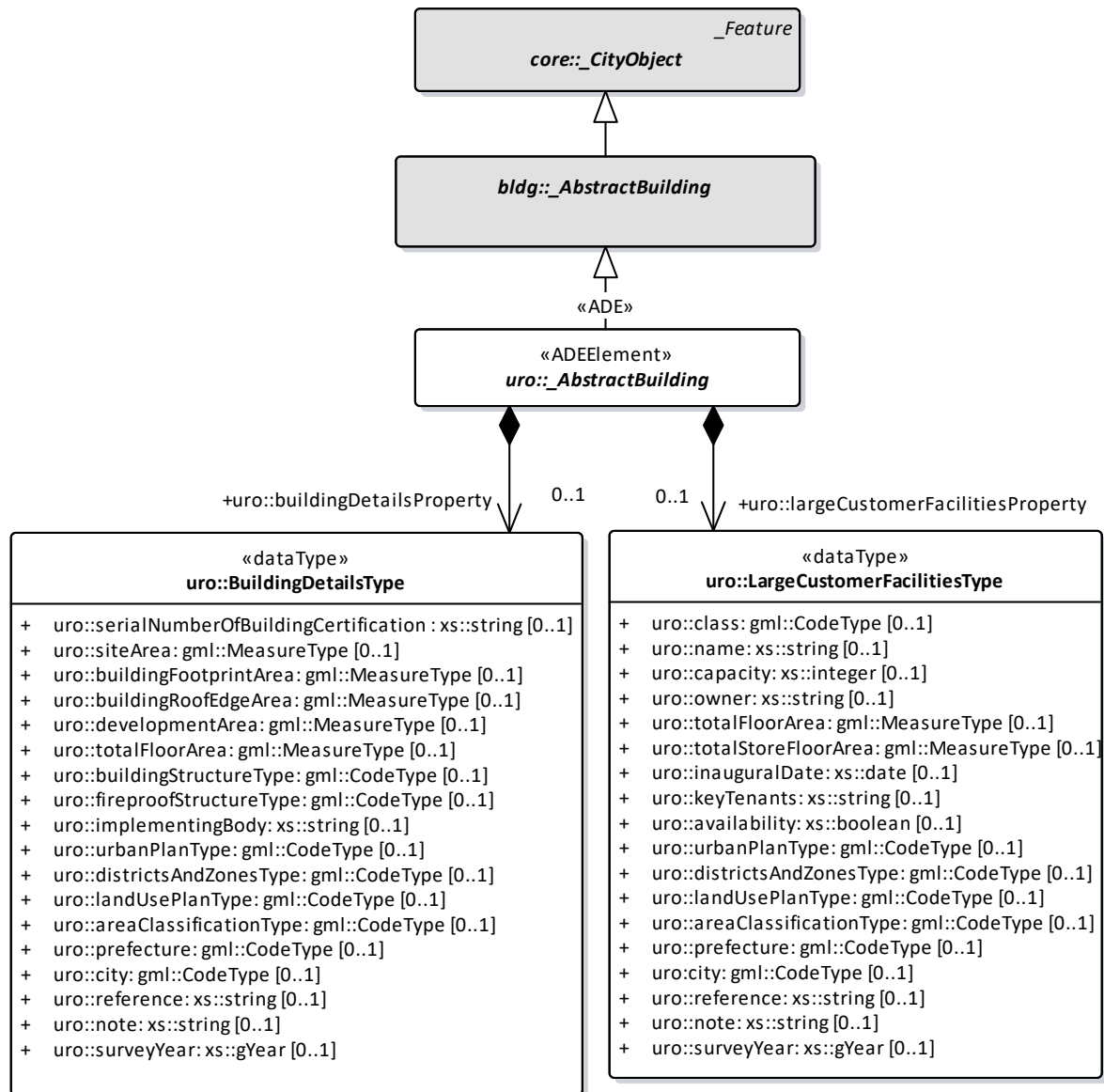
**Figure 1-1 Package diagram of Urban Object Data**

|                                     |   |
|-------------------------------------|---|
| <b>Module name</b>                  | Urban Object  |
| <b>XML namespace identifier</b>     | <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3</a>   |
| <b>XMLSchema location</b>           | <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/uro/1.3/urbanObject.xsd">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/uro/1.3/urbanObject.xsd</a>   |
| <b>Recommended namespace prefix</b> | uro   |
| <b>Description</b>                  | This module defines additional thematic and spatial aspects of city objects which enables users to examine and to analyse current situation and issues of urban areas. This module is the extension of the existing modules for city objects such as <i>building</i> , <i>land use</i> , <i>transportation</i> and <i>cityObjectGroup</i> . |

## 4.2 Object definition

### 4.2.1 Extended properties of Building

This module defines two classes which describe the detailed information of a building which is the extension of the Building module in CityGML. These elements are declared as a member of the general property of *bldg::AbstractBuilding* shown in Figure 1-2 and the XMLSchema Definition is attached in Annex A.



**Figure 1-2 UML diagram of extended properties of AbstractBuilding. Element names with the prefix uro are defined within this module.**

#### *Extended properties of \_AbstractBuilding*

| Property                             | Definition  |
|--------------------------------------|---|
| uro::buildingDetailsProperty         | Detailed descriptions of the building, e.g. building structure and total floor area |
| uro::largeCustomerFacilitiesProperty | Current status of the building when if the building is a large customer facility    |

```

<xs:element name="buildingDetails" type="BuildingDetailsPropertyType"
substitutionGroup="bldg:_GenericApplicationPropertyOfAbstractBuilding"/>
<xs:element name="largeCustomerFacilities" type="LargeCustomerFacilitiesPropertyType"
substitutionGroup="bldg:_GenericApplicationPropertyOfAbstractBuilding"/>

```

A *uro::buildingDetailsProperty* contains detailed information of a building. A *uro::largeCustomerFacilitiesProperty* contains detailed information for large customer facilities, such as shopping malls, hospitals and universities.

## BuildingDetailsType

| Type                                     | Definition  |
|--|---|
| uro::BuildingDetailsType                 | Detailed information of a building                              |
| Property                                 | Definition  |
| uro::serialNumberOfBuildingCertification | Serial number of the building certification                     |
| uro::siteArea                            | Site area of a building   |
| uro::buildingFootprintArea               | Building area of a footprint polygon                            |
| uro::buildingRoofEdgeArea                | Building area of a roof edge polygon                            |
| uro::developmentArea                     | Development area  |
| uro::totalFloorArea                      | Total floor area  |
| uro::buildingStructureType               | Structure type of the building                                  |
| uro::fireproofStructureType              | Fireproof structure type of the building                        |
| uro::implementingBody                    | Implement body of the building                                  |
| uro::urbanPlanType                       | Type of the building location designated by Urban Plan          |
| uro::districtAndZoneType                 | Type of the building location designated by Districts and Zones |
| uro::landUsePlanType                     | Type of the building location designated by Land Use Plan       |
| uro::areaClassificationType              | Type of the building location designated by Area classification |
| uro::prefecture                          | Prefecture name of the building location                        |
| uro::city                                | City name of the building location                              |
| uro::reference                           | Reference information of the building                           |
| uro::note                                | Additional information of the building                          |
| uro::surveyYear                          | Year of the survey  |

```

<xs:complexType name="BuildingDetailsType">
  <xs:sequence>
    <xs:element name="serialNumberOfBuildingCertification" type="xs:string" minOccurs="0"/>
    <xs:element name="siteArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="buildingFootprintArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="buildingRoofEdgeArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="developmentArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="totalFloorArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="buildingStructureType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="fireproofStructureType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="implementingBody" type="xs:string" minOccurs="0"/>
    <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="districtsAndZonesType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="landUsePlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="reference" type="xs:string" minOccurs="0"/>
    <xs:element name="note" type="xs:string" minOccurs="0"/>
    <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:element name="BuildingDetails" type="BuildingDetailsType"/>
<!-- ===== -->
<xs:complexType name="BuildingDetailsPropertyType">
  <xs:sequence>
    <xs:element ref="BuildingDetails"/>
  </xs:sequence>
</xs:complexType>

```

### LargeCustomerFacilitiesType

| Type                              | Definition   |
|-----------------------------------|--|
| uro:: LargeCustomerFacilitiesType | Detailed information of large-scale facilities which draw attention of customers |
| Property                          | Definition   |
| uro::class                        | Type of the facilities   |
| uro::name                         | Name of the facilities   |
| uro::capacity                     | Capacity of the facilities   |
| uro::owner                        | Name of the facilities' owner  |
| uro::totalFloorArea               | Total floor area   |
| uro::totalStoreFloorArea          | Total store floor area   |
| uro::inauguralDate                | Inaugural date of the facilities   |
| uro::keyTenants                   | Name of the key tenants in the facilities  |
| uro::availability                 | Service availability of the facilities   |
| uro::urbanPlanType                | Type of the facilities location designated by Urban Plan                         |
| uro::districtAndZoneType          | Type of the facilities location designated by Districts and Zones                |
| uro::landUsePlanType              | Type of the facilities location designated by Land Use Plan                      |
| uro::areaClassificationType       | Type of the facilities location designated by Area classification                |
| uro::prefecture                   | Prefecture name of the facilities location                                       |
| uro::city                         | City name of the facilities location   |
| uro::reference                    | Reference information of the building  |
| uro::note                         | Additional information of the building   |
| uro::surveyYear                   | Year of the survey   |

```

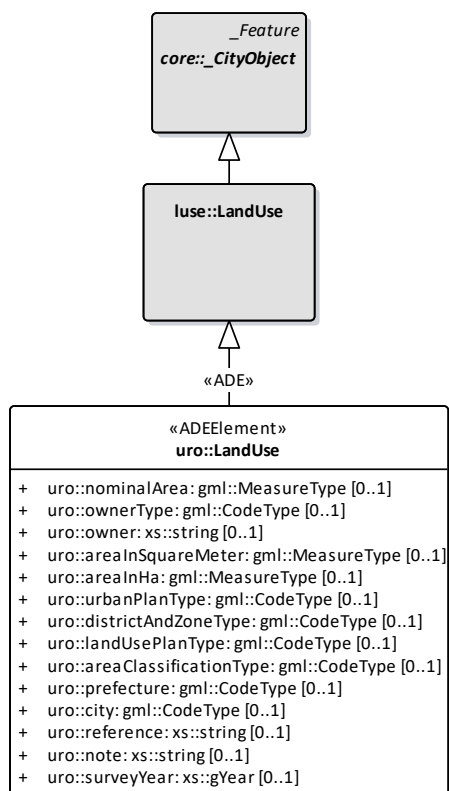
<xs:complexType name="LargeCustomerFacilitiesType">
  <xs:sequence>
    <xs:element name="class" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="name" type="xs:string" minOccurs="0"/>
    <xs:element name="capacity" type="xs:integer" minOccurs="0"/>
    <xs:element name="owner" type="xs:string" minOccurs="0"/>
    <xs:element name="totalFloorArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="totalStoreFloorArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="inauguralDate" type="xs:date" minOccurs="0"/>
    <xs:element name="keyTenants" type="xs:string" minOccurs="0"/>
    <xs:element name="availability" type="xs:boolean" minOccurs="0"/>
    <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="districtsAndZonesType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="landUsePlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="reference" type="xs:string" minOccurs="0"/>
    <xs:element name="note" type="xs:string" minOccurs="0"/>
    <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:element name="LargeCustomerFacilities" type="LargeCustomerFacilitiesType"/>
<!-- ===== -->
<xs:complexType name="LargeCustomerFacilitiesPropertyType">
  <xs:sequence>
    <xs:element ref="LargeCustomerFacilities"/>
  </xs:sequence>
</xs:complexType>

```

## 4.2.2 Extended properties of LandUse

This module defines one extended attribute of *luse::LandUse* as a member of the substitution group *luse::\_GenericApplicationPropertyOfLandUse*.

Figure 1-3 shows the extended properties for LandUse module and the XMLSchema Definition is attached in Annex A.



**Figure 1-3 UML diagram of LandUse. An element name with the prefix uro is defined within this module.**

### Extended property of LandUse

| Property                    | Definition  |
|-----------------------------|---|
| uro::nominalArea            | Nominal area of the land                                    |
| uro::ownerType              | Type of the land owner                                      |
| uro::owner                  | Name of the land owner                                      |
| uro::areaInSquareMeter      | Area of the land (m2)                                       |
| uro::areaInHa               | Area of the land (ha)                                       |
| uro::urbanPlanType          | Type of the land location designated by Urban Plan          |
| uro::districtAndZoneType    | Type of the land location designated by Districts and Zones |
| uro::landUsePlanType        | Type of the land location designated by Land Use Plan       |
| uro::areaClassificationType | Type of the land location designated by Area classification |
| uro::prefecture             | Prefecture name of the land location                        |
| uro::city                   | City name of the land location                              |
| uro::reference              | Reference information of the landuse                        |
| uro::note                   | Additional information of the land                          |
| uro::surveyYear             | Year of the survey  |

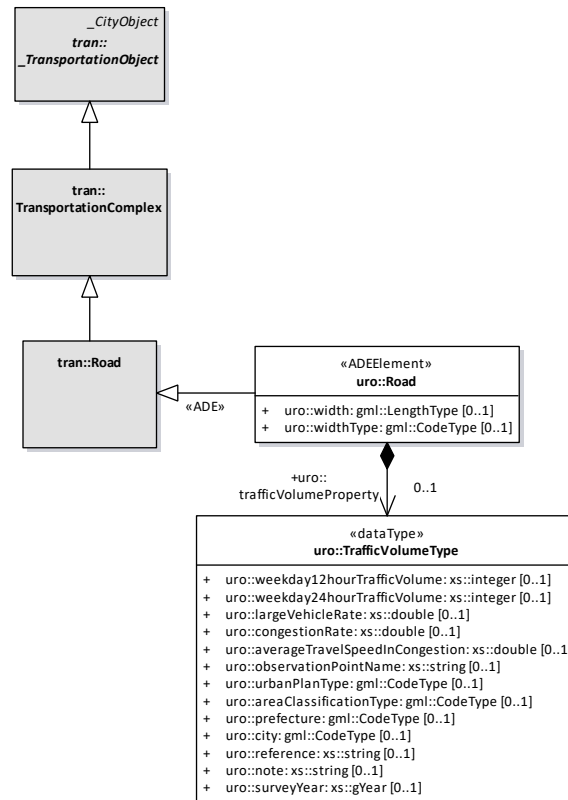
```

<xs:element name="nominalArea" type="gml:MeasureType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="ownerType" type="gml:CodeType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="owner" type="xs:string" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="areaInSquareMeter" type="gml:MeasureType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="areaInHa" type="gml:MeasureType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="urbanPlanType" type="gml:CodeType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="districtsAndZonesType" type="gml:CodeType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="landUsePlanType" type="gml:CodeType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="areaClassificationType" type="gml:CodeType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="prefecture" type="gml:CodeType"
substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="city" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="reference" type="xs:string" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="note" type="xs:string" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="surveyYear" type="xs:gYear" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>

```

### 4.2.3 Extended properties of Transportation

Transportation objects in i-UR describe a linear network of transportation. Therefore transportation features in the CityGML Transportation module with LOD0 geometry are applied. Some elements are added as members of the substitution group *tarn::\_GenericApplicationPropertyOfRoad* to describe detailed information of roads. The data structure of the transportation objects is shown in Figure 1-4 and the XMLSchema Definition is attached in Annex A.



**Figure 1-4 UML diagram of Transportation. Element names with the prefix uro are defined within this module.**

#### Extended Properties of Road

| Property                   | Definition                  |
|----------------------------|-----------------------------|
| uro::width                 | Typical road width          |
| uro::widthType             | Code allotted to road width |
| uro::trafficVolumeProperty | Traffic volume              |

```

<xs:element name="width" type="gml:LengthType" substitutionGroup="tran:_GenericApplicationPropertyOfRoad"/>
<xs:element name="widthType" type="gml:CodeType" substitutionGroup="tran:_GenericApplicationPropertyOfRoad"/>
<xs:element name="trafficVolume" type="TrafficVolumePropertyType"
substitutionGroup="tran:_GenericApplicationPropertyOfRoad"/>

```

A type *uro::TrafficVolumeType* is a class which describes the number of vehicles crossing a section of road per unit time.

#### TrafficVolumeType

| Type                                | Definition  |
|-------------------------------------|---|
| uro::TrafficVolumeType              | The number of vehicles crossing a section of road per unit time                   |
| Property                            | Definition  |
| uro::weekday12hourTrafficVolume     | The number of vehicles crossing a section of road per 12 hours on average weekday |
| uro::weekday24hourTrafficVolume     | The number of vehicles crossing a section of road per 24 hours on average weekday |
| uro::largeVehicleRate               | The percentage of the number of large vehicles within the total traffic volume    |
| uro::congestionRate                 | The ratio of 24-hour traffic volume to the design criteria                        |
| uro::averageTravelSpeedInCongestion | Average travel speed during the congestion period.                                |

|                             |   |
|-----------------------------|---|
| uro::observationPointName   | Name of the observation location.                           |
| uro::urbanPlanType          | Type of the road location designated by Urban Plan          |
| uro::areaClassificationType | Type of the road location designated by Area classification |
| uro::prefecture             | Prefecture name of the road location                        |
| uro::city                   | City name of the road location                              |
| uro::reference              | Reference information of the observation point              |
| uro::note                   | Other additional information                                |
| uro::surveyYear             | The year when the traffic survey was performed.             |

```

<xs:complexType name="TrafficVolumeType">
  <xs:sequence>
    <xs:element name="weekday12hourTrafficVolume" type="xs:integer" minOccurs="0"/>
    <xs:element name="weekday24hourTrafficVolume" type="xs:integer" minOccurs="0"/>
    <xs:element name="largeVehicleRate" type="xs:double" minOccurs="0"/>
    <xs:element name="congestionRate" type="xs:double" minOccurs="0"/>
    <xs:element name="averageTravelSpeedInCongestion" type="xs:double" minOccurs="0"/>
    <xs:element name="observationPointName" type="xs:string" minOccurs="0"/>
    <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="reference" type="xs:string" minOccurs="0"/>
    <xs:element name="note" type="xs:string" minOccurs="0"/>
    <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:element name="TrafficVolume" type="TrafficVolumeType"/>
<!-- ===== -->
<xs:complexType name="TrafficVolumePropertyType">
  <xs:sequence>
    <xs:element ref="TrafficVolume"/>
  </xs:sequence>
</xs:complexType>

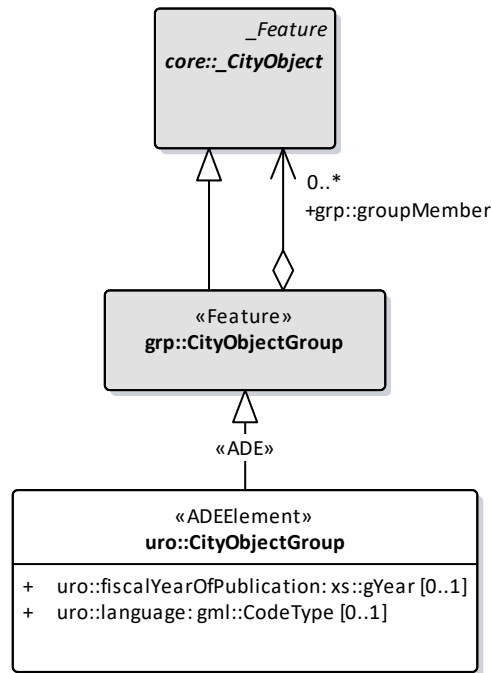
```

#### 4.2.4 Extended properties of CityObjectGroup

*CityObjectGroups* are defined as special *CityObjects* and aggregate *CityObjects* as shown in Figure 1-5. A *grp::CityObjectGroup* inherits attributes from the parent class *core::\_CityObject*. The attribute *core::creationDate* shows the date of dataset creation.

The *groupMember* property of *grp::CityObjectGroup* may contain a *core::\_CityObject* element inline or an XLink reference to a remote *core::\_CityObject* element, therefore extended city objects defined in this specification may also be contained in or referred from a *grp::CityObjectGroup*. XLink reference prevents data duplication and enables multiple use of the *CityObjects*.

Two elements, *uro::fiscalYearOfPublication* and *uro::language* are added as members of the substitution group *grp::\_GenericApplicationPropertyOfCityObjectGroup*. A *uro::fiscalYear* is used to describe the year when the result of data collection has been published and a *uro::language* clarifies the language used in the city objects.



**Figure 1-5 UML diagram of City Object Group**

*Extended properties of CityObjectGroup*

| Property                     | Definition                                    |
|------------------------------|---|
| uro::fiscalYearOfPublication | Fiscal year when the group has been published |
| uro::language                | Language used in the group                    |

```

<xs:element name="fiscalYearOfPublication" type="xs:gYear"
substitutionGroup="grp:_GenericApplicationPropertyOfCityObjectGroup"/>
<xs:element name="language" type="gml:CodeType"
substitutionGroup="grp:_GenericApplicationPropertyOfCityObjectGroup"/>

```

## Annex A (normative)

### XMLSchema Definition

#### A.1 XMLSchema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:uro="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3" xmlns:core="http://www.opengis.net/citygml/2.0" xmlns:luse="http://www.opengis.net/citygml/landuse/2.0" xmlns:bldg="http://www.opengis.net/citygml/building/2.0" xmlns:tran="http://www.opengis.net/citygml/transportation/2.0" xmlns:grp="http://www.opengis.net/citygml/cityobjectgroup/2.0" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gml="http://www.opengis.net/gml" targetNamespace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3" elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.3.0">
  <xs:annotation>
    <xs:documentation>XML Schema for Urban Object module</xs:documentation>
  </xs:annotation>
  <xs:import namespace="http://www.opengis.net/gml" schemaLocation="http://schemas.opengis.net/gml/3.1.1/base/gml.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/2.0" schemaLocation="http://schemas.opengis.net/citygml/2.0/cityGMLBase.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/transportation/2.0" schemaLocation="http://schemas.opengis.net/citygml/transportation/2.0/transportation.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/building/2.0" schemaLocation="http://schemas.opengis.net/citygml/building/2.0/building.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/landuse/2.0" schemaLocation="http://schemas.opengis.net/citygml/landuse/2.0/landUse.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/cityobjectgroup/2.0" schemaLocation="http://schemas.opengis.net/citygml/cityobjectgroup/2.0/cityObjectGroup.xsd"/>
  <!-- ===== -->
  <!-- ===== CityGML CityFeature module ===== -->
  <!-- ===== -->
  <!-- ===== Extended attribute for Building ===== -->
  <xs:element name="buildingDetails" type="uro:BuildingDetailsPropertyType" substitutionGroup="bldg:_GenericApplicationPropertyOfAbstractBuilding"/>
  <xs:element name="BuildingDetails" type="uro:BuildingDetailsType"/>
  <xs:complexType name="BuildingDetailsType">
    <xs:sequence>
      <xs:element name="serialNumberOfBuildingCertification" type="xs:string" minOccurs="0"/>
      <xs:element name="siteArea" type="gml:MeasureType" minOccurs="0"/>
      <xs:element name="buildingFootprintArea" type="gml:MeasureType" minOccurs="0"/>
      <xs:element name="buildingRoofEdgeArea" type="gml:MeasureType" minOccurs="0"/>
      <xs:element name="developmentArea" type="gml:MeasureType" minOccurs="0"/>
      <xs:element name="totalFloorArea" type="gml:MeasureType" minOccurs="0"/>
      <xs:element name="buildingStructureType" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="fireproofStructureType" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="implementingBody" type="xs:string" minOccurs="0"/>
      <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="districtsAndZonesType" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="landUsePlanType" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
      <xs:element name="reference" type="xs:string" minOccurs="0"/>
      <xs:element name="note" type="xs:string" minOccurs="0"/>
      <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>

```

```

</xs:complexType>
<xs:complexType name="BuildingDetailsPropertyType">
  <xs:sequence>
    <xs:element ref="uro:BuildingDetails"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:element name="largeCustomerFacilities" type="uro:LargeCustomerFacilitiesPropertyType" substitutionGroup="bldg:
_GenericApplicationPropertyOfAbstractBuilding"/>
<!-- ===== -->
<xs:element name="LargeCustomerFacilities" type="uro:LargeCustomerFacilitiesType"/>
<xs:complexType name="LargeCustomerFacilitiesType">
  <xs:sequence>
    <xs:element name="class" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="name" type="xs:string" minOccurs="0"/>
    <xs:element name="capacity" type="xs:integer" minOccurs="0"/>
    <xs:element name="owner" type="xs:string" minOccurs="0"/>
    <xs:element name="totalFloorArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="totalStoreFloorArea" type="gml:MeasureType" minOccurs="0"/>
    <xs:element name="inauguralDate" type="xs:date" minOccurs="0"/>
    <xs:element name="keyTenants" type="xs:string" minOccurs="0"/>
    <xs:element name="availability" type="xs:boolean" minOccurs="0"/>
    <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="districtsAndZonesType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="landUsePlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="reference" type="xs:string" minOccurs="0"/>
    <xs:element name="note" type="xs:string" minOccurs="0"/>
    <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="LargeCustomerFacilitiesPropertyType">
  <xs:sequence>
    <xs:element ref="uro:LargeCustomerFacilities"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== Extended attribute for Land Use ===== -->
<xs:element name="nominalArea" type="gml:MeasureType" substitutionGroup="luse:_GenericApplicationPropertyOfLand
Use"/>
<xs:element name="ownerType" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"
/>
<xs:element name="owner" type="xs:string" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="areaInSquareMeter" type="gml:MeasureType" substitutionGroup="luse:_GenericApplicationProperty
OfLandUse"/>
<xs:element name="areaInHa" type="gml:MeasureType" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"
"/>
<xs:element name="urbanPlanType" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationPropertyOfLand
Use"/>
<xs:element name="districtsAndZonesType" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationProperty
OfLandUse"/>
<xs:element name="landUsePlanType" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationPropertyOfLand
Use"/>
<xs:element name="areaClassificationType" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationProperty
OfLandUse"/>
<xs:element name="prefecture" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"
/>
<xs:element name="city" type="gml:CodeType" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="reference" type="xs:string" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>

```

```

<xs:element name="note" type="xs:string" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<xs:element name="surveyYear" type="xs:gYear" substitutionGroup="luse:_GenericApplicationPropertyOfLandUse"/>
<!-- ===== Extended attribute for Road ===== -->
<xs:element name="width" type="gml:LengthType" substitutionGroup="tran:_GenericApplicationPropertyOfRoad"/>
<xs:element name="widthType" type="gml:CodeType" substitutionGroup="tran:_GenericApplicationPropertyOfRoad"/>
<xs:element name="trafficVolume" type="uro:TrafficVolumePropertyType" substitutionGroup="tran:_GenericApplicationPropertyOfRoad"/>
<!-- ===== -->
<xs:element name="TrafficVolume" type="uro:TrafficVolumeType"/>
<xs:complexType name="TrafficVolumeType">
  <xs:sequence>
    <xs:element name="weekday12hourTrafficVolume" type="xs:integer" minOccurs="0"/>
    <xs:element name="weekday24hourTrafficVolume" type="xs:integer" minOccurs="0"/>
    <xs:element name="largeVehicleRate" type="xs:double" minOccurs="0"/>
    <xs:element name="congestionRate" type="xs:double" minOccurs="0"/>
    <xs:element name="averageTravelSpeedInCongestion" type="xs:double" minOccurs="0"/>
    <xs:element name="observationPointName" type="xs:string" minOccurs="0"/>
    <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="reference" type="xs:string" minOccurs="0"/>
    <xs:element name="note" type="xs:string" minOccurs="0"/>
    <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="TrafficVolumePropertyType">
  <xs:sequence>
    <xs:element ref="uro:TrafficVolume"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== Extended attribute for CityObjectGroup ===== -->
<xs:element name="fiscalYearOfPublication" type="xs:gYear" substitutionGroup="grp:_GenericApplicationPropertyOfCityObjectGroup"/>
<xs:element name="language" type="gml:CodeType" substitutionGroup="grp:_GenericApplicationPropertyOfCityObjectGroup"/>
</xs:schema>

```

## A.2 Sample data (informative)

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- sample data edited by i-Urban Revitalization Promotion Committee Specification WG / source Fundamental Geospatial Data of GSI -->
<core:CityModel xmlns:uro="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3" xmlns:core="http://www.opengis.net/citygml/2.0" xmlns:luse="http://www.opengis.net/citygml/landuse/2.0" xmlns:bldg="http://www.opengis.net/citygml/building/2.0" xmlns:tran="http://www.opengis.net/citygml/transportation/2.0" xmlns:grp="http://www.opengis.net/citygml/cityobjectgroup/2.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3 http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/uro/1.3/urbanObject.xsd http://www.opengis.net/citygml/2.0 http://schemas.opengis.net/citygml/2.0/cityGMLBase.xsd http://www.opengis.net/citygml/landuse/2.0 http://schemas.opengis.net/citygml/landuse/2.0/landUse.xsd http://www.opengis.net/citygml/building/2.0 http://schemas.opengis.net/citygml/building/2.0/building.xsd http://www.opengis.net/citygml/transportation/2.0 http://schemas.opengis.net/citygml/transportation/2.0/transportation.xsd http://www.opengis.net/citygml/cityobjectgroup/2.0 http://schemas.opengis.net/citygml/cityobjectgroup/2.0/cityObjectGroup.xsd http://www.opengis.net/gml http://schemas.opengis.net/gml/3.1.1/base/gml.xsd">

```

```

<gml:boundedBy>
  <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSSG/0/6697">
    <gml:lowerCorner srsDimension="3">35.8434 130.488 0</gml:lowerCorner>
    <gml:upperCorner srsDimension="3">33.8459 130.494 50</gml:upperCorner>
  </gml:Envelope>
</gml:boundedBy>
<core:cityObjectMember>
  <bldg:Building gml:id="building503063191001">
    <bldg:class codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_classification.xml">2000</bldg:class>
    <bldg:function>公益施設用地</bldg:function>
    <bldg:usage>小・中・高等学校等</bldg:usage>
    <bldg:yearOfConstruction>1997</bldg:yearOfConstruction>
    <bldg:storeysAboveGround>3</bldg:storeysAboveGround>
    <bldg:storeysBelowGround>1</bldg:storeysBelowGround>
    <bldg:lod1Solid>
      <gml:Solid>
        <gml:exterior>
          <gml:CompositeSurface>
            <gml:surfaceMember>
              <gml:Polygon>
                <gml:exterior>
                  <gml:LinearRing>
                    <gml:pos>33.805525 130.545234 17.9</gml:pos>
                    <gml:pos>33.805410 130.5452 17.9</gml:pos>
                    <gml:pos>33.805398 130.545255 17.9</gml:pos>
                    <gml:pos>33.805416 130.545260 17.9</gml:pos>
                    <gml:pos>33.805399 130.545347 17.9</gml:pos>
                    <gml:pos>33.805496 130.545375 17.9</gml:pos>
                    <gml:pos>33.805525 130.545234 17.9</gml:pos>
                  </gml:LinearRing>
                </gml:exterior>
              </gml:Polygon>
            </gml:surfaceMember>
            <gml:surfaceMember>
              <gml:Polygon>
                <gml:exterior>
                  <gml:LinearRing>
                    <gml:pos>33.805525 130.545234 17.9</gml:pos>
                    <gml:pos>33.805496 130.545375 17.9</gml:pos>
                    <gml:pos>33.805496 130.545375 5.9</gml:pos>
                    <gml:pos>33.805525 130.545234 5.9</gml:pos>
                    <gml:pos>33.805525 130.545234 17.9</gml:pos>
                  </gml:LinearRing>
                </gml:exterior>
              </gml:Polygon>
            </gml:surfaceMember>
            <gml:surfaceMember>
              <gml:Polygon>
                <gml:exterior>
                  <gml:LinearRing>
                    <gml:pos>33.80539922 130.545347 17.9</gml:pos>
                    <gml:pos>33.80541694 130.5452606 17.9</gml:pos>
                    <gml:pos>33.80541694 130.5452606 5.9</gml:pos>
                    <gml:pos>33.80539922 130.545347 5.9</gml:pos>
                    <gml:pos>33.80539922 130.545347 17.9</gml:pos>
                  </gml:LinearRing>
                </gml:exterior>
              </gml:Polygon>
            </gml:surfaceMember>
          </gml:CompositeSurface>
        </gml:exterior>
      </gml:Solid>
    </bldg:lod1Solid>
  </bldg:Building>
</core:cityObjectMember>

```

<-- omitted -->

```
<gml:surfaceMember>
  <gml:Polygon>
    <gml:exterior>
      <gml:LinearRing>
        <gml:pos>33.80549653 130.5453755 17.9</gml:pos>
        <gml:pos>33.80539922 130.545347 17.9</gml:pos>
        <gml:pos>33.80539922 130.545347 5.9</gml:pos>
        <gml:pos>33.80549653 130.5453755 5.9</gml:pos>
        <gml:pos>33.80549653 130.5453755 17.9</gml:pos>
      </gml:LinearRing>
    </gml:exterior>
  </gml:Polygon>
</gml:surfaceMember>
<gml:surfaceMember>
  <gml:Polygon>
    <gml:exterior>
      <gml:LinearRing>
        <gml:pos>33.8055255 130.5452343 5.9</gml:pos>
        <gml:pos>33.80549653 130.5453755 5.9</gml:pos>
        <gml:pos>33.80539922 130.545347 5.9</gml:pos>
        <gml:pos>33.80541694 130.5452606 5.9</gml:pos>
        <gml:pos>33.80539897 130.5452553 5.9</gml:pos>
        <gml:pos>33.80541022 130.5452004 5.9</gml:pos>
        <gml:pos>33.8055255 130.5452343 5.9</gml:pos>
      </gml:LinearRing>
    </gml:exterior>
  </gml:Polygon>
</gml:surfaceMember>
</gml:CompositeSurface>
</gml:exterior>
</gml:Solid>
</bldg:lod1Solid>
<uro:buildingDetails>
  <uro:BuildingDetails>
    <uro:serialNumberOfBuildingCertification>福ワ-182039-a1</uro:serialNumberOfBuildingCertification>
    <uro:siteArea uom="m2">3300</uro:siteArea>
    <uro:buildingFootprintArea uom="m2">50</uro:buildingFootprintArea>
    <uro:buildingRoofEdgeArea uom="m2">56.3</uro:buildingRoofEdgeArea>
    <uro:developmentArea uom="m2">10.5</uro:developmentArea>
    <uro:buildingStructureType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_buildingStructureType.xml">9020</uro:buildingStructureType>
    <uro:fireproofStructureType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_fireproofStructureType.xml">9020</uro:fireproofStructureType>
    <uro:implementingBody>片岡建設</uro:implementingBody>
    <uro:urbanPlanType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_uro:urbanPlanType.xml">1010</uro:urbanPlanType>
    <uro:districtsAndZonesType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_districtsAndZones.xml">1000</uro:districtsAndZonesType>
    <uro:landUsePlanType>5070</uro:landUsePlanType>
    <uro:areaClassificationType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_areaClassification.xml">1030</uro:areaClassificationType>
    <uro:prefecture codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_uro:prefecture.xml">40</uro:prefecture>
    <uro:city codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_localPublicAuthorities.xml">220</uro:city>
    <uro:reference>ア 1</uro:reference>
    <uro:note>なし</uro:note>
    <uro:surveyYear>2016</uro:surveyYear>
```

```
</uro:BuildingDetails>  
</uro:buildingDetails>  
</bldg:Building>  
</core:cityObjectMember>  
</core:CityModel>
```

## Annex B (informative)

### Code lists for Urban Object Data

This annex exemplifies the specification of code lists for enumerative attributes of type *gml:CodeType* in Urban Planning ADE and provides proposals for selected attributes. Please note that this annex is non-normative and the presented code lists are neither mandatory nor complete.

Some of code lists in this annex extends the code lists proposed by the SIG 3D shown in Annex C of CityGML.

#### Code lists for Building

| Code list for the <i>_AbstractBuilding</i> attribute class  |                    |      |                                     |
|---|--------------------|------|-------------------------------------|
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_class.xml</a> |                    |      |                                     |
| 1000  | habitation         | 1090 | agriculture, forestry               |
| 1001  | house              | 1091 | agriculture, forestry and fisheries |
| 1002  | apartment          | 1100 | school, education, research         |
| 1003  | dwelling with shop | 1110 | maintenance and waste management    |
| 1004  | apartment withshop | 1120 | healthcare                          |
| 1005  | office with whop   | 1130 | communicating                       |
| 1010  | sanitation         | 1140 | security                            |
| 1020  | administration     | 1150 | storage                             |
| 1030  | business, trade    | 1160 | industry                            |
| 1031  | business           | 1170 | traffic                             |
| 1032  | commercial         | 1180 | function                            |
| 1033  | commercial complex |      |                                     |
| 1034  | hotel              | 2000 | education, welfare                  |
| 1040  | catering           | 2010 | Transportation                      |
| 1050  | recreation         |      |                                     |
| 1060  | sport              | 8000 | other                               |
| 1070  | culture            | 9000 | unexamined                          |
| 1080  | church institution | 9010 | exception                           |
|   |                    | 9020 | unknown                             |
| Code values in grey cells are defined in the Code lists proposed by the SIG 3D in CityGML.  |                    |      |                                     |

| Code list of the <i>BuildingDetails</i> attribute <i>buildingStructureType</i>  |                     |      |            |
|---|---------------------|------|------------|
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_buildingStructureType.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_buildingStructureType.xml</a> |                     |      |            |
| 1010  | wooden              | 9000 | unexamined |
| 1020  | non-wooden          | 9010 | exception  |
| 1030  | reinforced concrete | 9020 | unknown    |

| Code list of the <i>BuildingDetails</i> attribute <i>fireproofStructureType</i>   |                |      |            |
|---|----------------|------|------------|
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_fireproofStructureType.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Building_fireproofStructureType.xml</a> |                |      |            |
| 1010  | fireproof      | 9000 | unexamined |
| 1020  | semi-fireproof | 9010 | exception  |
| 1030  | others         | 9020 | unknown    |

| Code list for the <i>LargeCustomerFacilities</i> attribute class  |   |      |          |
|---|---|------|----------|
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LargeCustomerFacilities_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LargeCustomerFacilities_class.xml</a> |   |      |          |
| 1010  | large entertainment and commercial facilities | 1040 | hospital |

|      |  |      |                        |
|------|--|------|------------------------|
| 1020 | middle sized entertainment and commercial facilities | 1050 | welfare facilities     |
| 1030 | public facilities                                    | 1060 | university and college |

|   |
|---|
| Code list of the <i>BuildingDetails</i> and the <i>LargeCustomerFacilities</i> attribute <i>urbanPlanType</i> |
| See Code list for the <i>UrbanPlan</i> attribute <i>class</i> in part 2                                       |

|   |
|---|
| Code list of the <i>BuildingDetails</i> and the <i>LargeCustomerFacilities</i> attribute <i>districtsAndZonesType</i> |
| See Code list for the <i>DistrictsAndZones</i> attribute <i>class</i> in part 2                                       |

|   |
|---|
| Code list of the <i>BuildingDetails</i> and the <i>LargeCustomerFacilities</i> attribute <i>landUsePlanType</i> |
| See Code list for the <i>LandUsePlan</i> attribute <i>class</i> in part 2                                       |

|  |
|--|
| Code list of the <i>BuildingDetails</i> and the <i>LargeCustomerFacilities</i> attribute <i>areaClassificationType</i> |
| See Code list for the <i>AreaClassification</i> attribute <i>class</i> in part 2                                       |

|  |
|--|
| Code list of the <i>BuildingDetails</i> and the <i>LargeCustomerFacilities</i> attribute <i>prefecture</i> |
| See Code list for the <i>Administration</i> attribute <i>prefecture</i> in part 2                          |

|  |
|--|
| Code list of the <i>BuildingDetails</i> and the <i>LargeCustomerFacilities</i> attribute <i>city</i> |
| See Code list for the <i>Administration</i> attribute <i>city</i> in part 2                          |

## Code lists for LandUse

|   |                                |      |                                     |
|---|--------------------------------|------|-------------------------------------|
| Code list of the <i>LandUse</i> attributes <i>function</i>  |                                |      |                                     |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandUse_function.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandUse_function.xml</a> |                                |      |                                     |
| 1010  | Residential                    | 2050 | Track                               |
| 1020  | Industry and business          | 2060 | Square                              |
| 1030  | MixedUse                       | 2010 | Grassland                           |
| 1040  | Special Function Area          | 3020 | Agriculture                         |
| 1050  | Monument                       | 3030 | Forest                              |
| 1060  | Dump                           | 3040 | Grove                               |
| 1070  | Mining                         | 3050 | heath                               |
| 1100  | Park                           | 3060 | Moor                                |
| 1120  | Cemetery                       | 3070 | Marsh                               |
| 1130  | Sports, leisure and recreation | 3080 | Untilled land                       |
| 1140  | Open pit, quarry               | 4010 | River                               |
| 2010  | Road                           | 4020 | Standing Waterbody                  |
| 2020  | Railway                        | 4030 | Harbour                             |
| 2030  | Airfield                       | 4040 | Sea                                 |
| 2040  | Shipping                       |      |                                     |
| 5010  | Industry                       | 5110 | Public land                         |
| 5020  | Business (retail)              | 5120 | Public open space 1                 |
| 5030  | Business (other)               | 5130 | Public open space 2                 |
| 5040  | Water                          | 5140 | Other communal facilities           |
| 5050  | Natural area 1                 | 5150 | Other open space                    |
| 5060  | Natural area 2                 | 5160 | Residential not in use              |
| 5070  | Communal facilities            | 5170 | Agriculture, Forestry and Fisheries |
| 5080  | Rice paddy                     | 9000 | Unexamined                          |
| 5090  | Field                          | 9010 | Exception                           |
| 5100  | Transportation                 | 9020 | Unknown                             |

Code values in grey cells are defined in the Code lists proposed by the SIG 3D in CityGML.

Code list of the *LandUse* attributes *ownerType*

[http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandUse\\_ownerType.xml](http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandUse_ownerType.xml)

|      |                        |      |            |
|------|------------------------|------|------------|
| 1010 | National government    | 9000 | Unexamined |
| 1020 | prefectural government | 9010 | Exception  |
| 1030 | Municipality           | 9020 | Unknown    |
| 1040 | Public corporatoin     |      |            |

Code list of the *LandUse* attribute *urbanPlanType*

See Code list for the *UrbanPlan* attribute *class* in part 2

Code list of the *LandUse* attribute *districtsAndZonesType*

See Code list for the *DistrictsAndZones* attribute *class* in part 2

Code list of the *LandUse* attribute *landUsePlanType*

See Code list for the *LandUsePlan* attribute *class* in part 2

Code list of the *LandUse* attribute *areaClassificationType*

See Code list for the *AreaClassification* attribute *class* in part 2

Code list of the *LandUse* attribute *prefecture*

See Code list for the *Administration* attribute *prefecture* in part 2

Code list of the *LandUse* attribute *city*

See Code list for the *Administration* attribute *city* in part 2

## Code lists for Transportation service and Road

Code list of the *Road* attributes *function*

[http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Road\\_function.xml](http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Road_function.xml)

|      |                               |      |                |
|------|-------------------------------|------|----------------|
| 1010 | freeway/motorway              | 1050 | municipal road |
| 1020 | highway/national primary road | 2700 | others         |
| 3010 | prefectural road              |      |                |

Code values in grey cells are defined in the Code lists proposed by the SIG 3D in CityGML.

Code list of the *Road* attributes *widthType*

[http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Road\\_widthType.xml](http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Road_widthType.xml)

|      |          |      |            |
|------|----------|------|------------|
| 1010 | 12m -    | 9000 | Unexamined |
| 1020 | 4m - 12m | 9010 | Exception  |
| 1030 | - 4m     | 9020 | Unknown    |

Code list of the *TransportationSrvice* and *Road* attribute *urbanPlanType*

See Code list for the *UrbanPlan* attribute *class*

|  |
|--|
| Code list of the <i>TransportationSrvce</i> and <i>Road</i> attribute <i>districtsAndZonesType</i> |
| See Code list for the <i>DistrictsAndZones</i> attribute <i>class</i>                              |

|  |
|--|
| Code list of the <i>TransportationSrvce</i> and <i>Road</i> attribute <i>landUsePlanType</i> |
| See Code list for the <i>LandUsePlan</i> attribute <i>class</i> in part 2                    |

|   |
|---|
| Code list of the <i>TransportationSrvce</i> and <i>Road</i> attribute <i>areaClassificationType</i> |
| See Code list for the <i>AreaClassification</i> attribute <i>class</i> in part 2                    |

|   |
|---|
| Code list of the <i>TransportationSrvce</i> and <i>Road</i> attribute <i>prefecture</i> |
| See Code list for the <i>Administration</i> attribute <i>prefecture</i> in part 2       |

|   |
|---|
| Code list of the <i>TransportationSrvce</i> and <i>Road</i> attribute <i>city</i> |
| See Code list for the <i>Administration</i> attribute <i>city</i> in part 2       |

## Code lists for CityObjectGroup

|   |            |      |                |
|---|------------|------|----------------|
| Code list of the <i>CityObjectGroup</i> attribute <i>usage</i>  |            |      |                |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/CityObjectGroup_usage.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/CityObjectGroup_usage.xml</a> |            |      |                |
| 1000  | lod1Storey | 2000 | urban planning |
| 1010  | lod2Storey |      |                |
| 1020  | lod3Storey |      |                |
| 1040  | lod4Storey |      |                |
| Code values in grey cells are defined in the Code lists proposed by the SIG 3D in CityGML.  |            |      |                |

|   |  |
|---|--|
| Code list of the <i>CityObjectGroup</i> attribute <i>language</i>   |  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_language.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_language.xml</a> |  |
| ISO 639-1:2002, Codes for the representation of names of languages — Part 1: Alpha-2 code   |  |

## **Part 2. Urban Function Data Encoding Specification**

### **1. Scope**

Plans and regulations are important information in urban development, landscape preservation, and disaster management. Information related to plans and regulation, such as administrative boundaries and zoning works, are conditions or constraints for spatial planning and are conceptual and virtual objects in urban areas.

This document defines conceptual and virtual objects in urban areas as “urban function objects” and specifies the encoding format of these objects.

### **2. Normative references**

Followings are normative references of this document.

- OpenGIS® OGC City Geography Markup Language (CityGML) Encoding Standard, Version 2.0, OGC document 12-019

### **3. Conventions**

#### **3.1 Terms and definitions**

No terms and definitions are listed in this document.

#### **3.2 Abbreviated terms**

ADE Application Domain Extensions

CityGML City Geography Markup Language

GML Geography Markup Language

OGC Open Geospatial Consortium

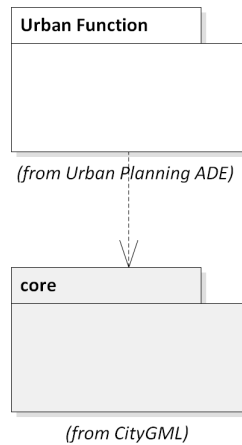
UML Unified Modeling Language

## **4. Urban Function Data Encoding**

### **4.1 Overview**

The Urban Function Data Encoding is an extension of CityGML. This document defines the elements and types according to the rules of the Application Domain Extensions (ADE) which are necessary for describing urban functions but not defined in CityGML. Those already defined in CityGML are imported without any inconsistency.

Figure 2-1 shows the structure of the Urban Function Data and the XMLSchema Definition is attached in Annex A.



**Figure 2-1 Package diagram of Urban Function Data**

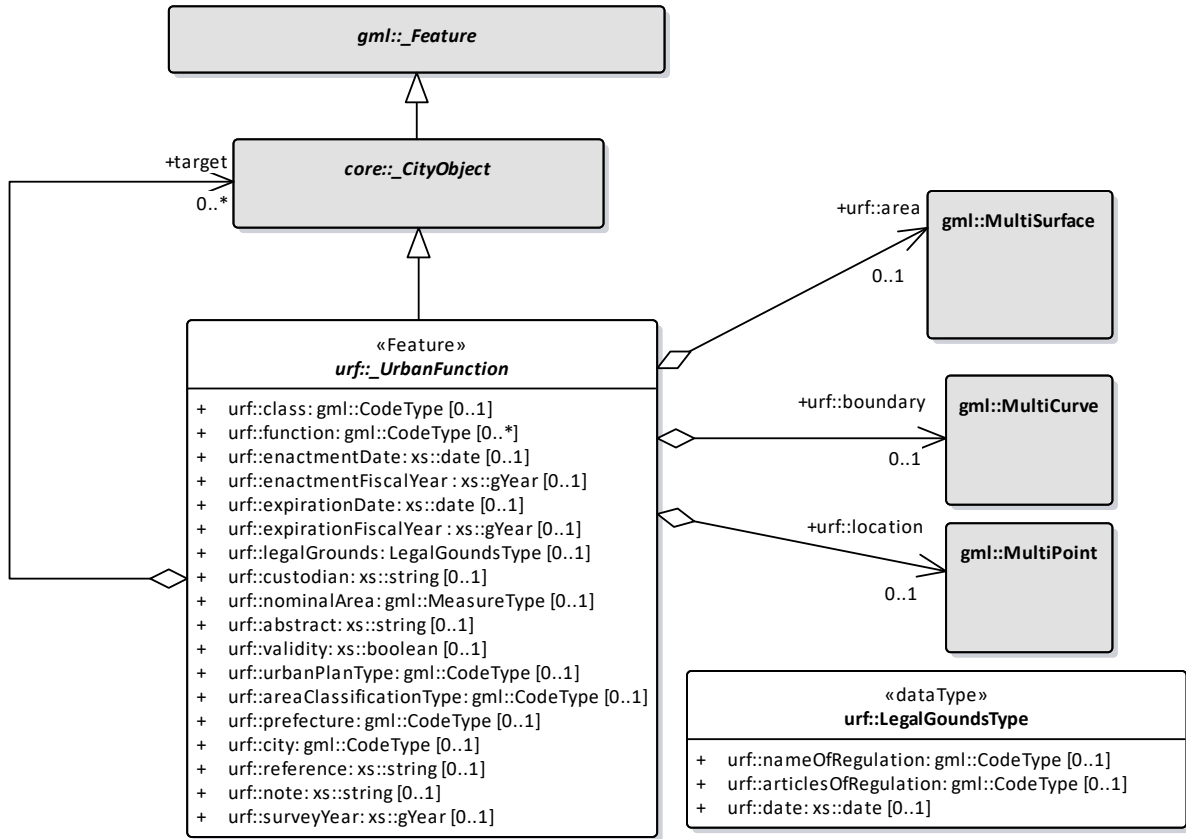
Urban function module defines conceptual and virtual objects such as administrative boundaries and zoning in urban areas. These objects (hereafter “urban function objects”) are not visible in the real world, but guide and lead city objects such as land use and building to what they should be. The urban function objects have associations with visible city object/objects to add them new functions.

|                                     |   |
|-------------------------------------|---|
| <b>Module name</b>                  | Urban Function  |
| <b>XML namespace identifier</b>     | <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urf/1.3">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urf/1.3</a>   |
| <b>XMLSchema location</b>           | <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/urf/1.3/urbanFunction.xsd">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/urf/1.3/urbanFunction.xsd</a> |
| <b>Recommended namespace prefix</b> | urf   |
| <b>Description</b>                  | This module defines conceptual or virtual objects in the urban areas which give a meaning to specific area, boundary or position.<br>e.g. Administration area, Urban planning area  |

## 4.2 Object definition

### 4.2.1 UrbanFunctionType, \_UrbanFunction

An *urf::\_UrbanFunction* is a root class of this module and inherits from *core::\_CityObjects*. The *urf::\_UrbanFunction* and its child elements can obtain its geometry directly or indirectly through associations. When it has an association with a city object, the city object is added enriched with a new function. For example, a substantial well-constructed public building (e.g. school) is designated as an evacuation shelter when a disaster occurs. Figure 2-2 shows the structure of *urf::\_UrbanFunction*.



**Figure 2-2 UML diagram of *urf::UrbanFunction***

| Object                      | Definition   |
|-----------------------------|--|
| urf::_UrbanFunction         | Conceptual and virtual objects which give a function to city objects.                          |
| Property                    | Definition   |
| urf::class                  | Type of urban function   |
| urf::function               | Usage of urban function  |
| urf::enactmentDate          | Enactment date   |
| urf::enactmentFiscalYear    | Fiscal year of enactment   |
| urf::expirationDate         | Expiration date  |
| urf::expirationFiscalYear   | Fiscal year of expiration  |
| urf::legalGrounds           | Legal basis of the designation   |
| urf::custodian              | name of the party who designated the urban function  |
| urf::nominalArea            | nominal area of the designated area  |
| urf::abstract               | abstract description of the designated area  |
| urf::validity               | validity of the designation; valid, lapse or abolish<br>valid : true, lapse or abolish : false |
| urf::urbanPlanType          | Type of the location designated by Urban Plan  |
| urf::areaClassificationType | Type of the location designated by Area classification   |
| urf::prefecture             | Prefecture name of the location  |
| urf::city                   | City name of the location  |
| urf::reference              | reference information of the urban function  |
| urf::note                   | Additional remarks   |
| urf::surveyYear             | The year when the traffic survey was performed.  |
| urf::area                   | A specific area or extent which someone may find useful or interesting                         |

|               |  |
|---------------|--|
| urf::boundary | A specific boundary location which someone may find useful or interesting. |
| urf::location | A specific point location which someone may find useful or interesting.    |
| urf::target   | Reference to more than one city objects                                    |

```

<xs:complexType name="UrbanFunctionType" abstract="true">
  <xs:complexContent>
    <xs:extension base="core:AbstractCityObjectType">
      <xs:sequence>
        <xs:element name="class" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="function" type="gml:CodeType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="enactmentDate" type="xs:date" minOccurs="0"/>
        <xs:element name="enactmentFiscalYear" type="xs:gYear" minOccurs="0"/>
        <xs:element name="expirationDate" type="xs:date" minOccurs="0"/>
        <xs:element name="expirationFiscalYear" type="xs:gYear" minOccurs="0"/>
        <xs:element name="legalGrounds" type="LegalGroundsPropertyType" minOccurs="0"/>
        <xs:element name="custodian" type="xs:string" minOccurs="0"/>
        <xs:element name="nominalArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="abstract" type="xs:string" minOccurs="0"/>
        <xs:element name="validity" type="xs:boolean" minOccurs="0"/>
        <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="reference" type="xs:string" minOccurs="0"/>
        <xs:element name="note" type="xs:string" minOccurs="0"/>
        <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
        <xs:element name="area" type="gml:MultiSurfacePropertyType" minOccurs="0"/>
        <xs:element name="boundary" type="gml:MultiCurvePropertyType" minOccurs="0"/>
        <xs:element name="location" type="gml:MultiPointPropertyType" minOccurs="0"/>
        <xs:element name="target" type="TargetPropertyType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element ref="_GenericApplicationPropertyOfUrbanFunction" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="_UrbanFunction" type="UrbanFunctionType" abstract="true"
substitutionGroup="core:_CityObject"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfUrbanFunction" type="xs:anyType" abstract="true"/>
<!-- ===== -->
<xs:complexType name="TargetPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="core:_CityObject"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== --> <xs:complexType

```

The type “TargetPropertyType” is used for an association with a *core:\_CityObject*.

The element “\_GenericApplicationPropertyOfUrbanFunction” is reserved for future extension and not used in this document. For each subclass of *urf::\_UrbanFunction*, the elements “\_GenericApplicationPropertyOf...” are declared for the same reason.

#### 4.2.2 LegalGroundsType

| Type                  | Definition                          |
|-----------------------|-------------------------------------|
| urf::LegalGroundsType | Legal grounds of the urban function |

| Property                  | Definition                        |
|---------------------------|-----------------------------------|
| urf::nameOfRegulation     | Name of the related regulation    |
| urf::articlesOfRegulation | Articles number of the regulation |
| urf::date                 | Issued date                       |

```

<xs:complexType name="LegalGroundsType">
  <xs:sequence>
    <xs:element name="nameOfRegulation" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="articlesOfRegulation" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="date" type="xs:date" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:element name="LegalGrounds" type="LegalGroundsType"/>
<!-- ===== -->
<xs:complexType name="LegalGroundsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="LegalGrounds"/>
  </xs:sequence>
</xs:complexType>

```

Specific objects such as administrative boundary and land use regulation are defined as subclasses of *urf\_UrbanFunction* (Figure 2-3).

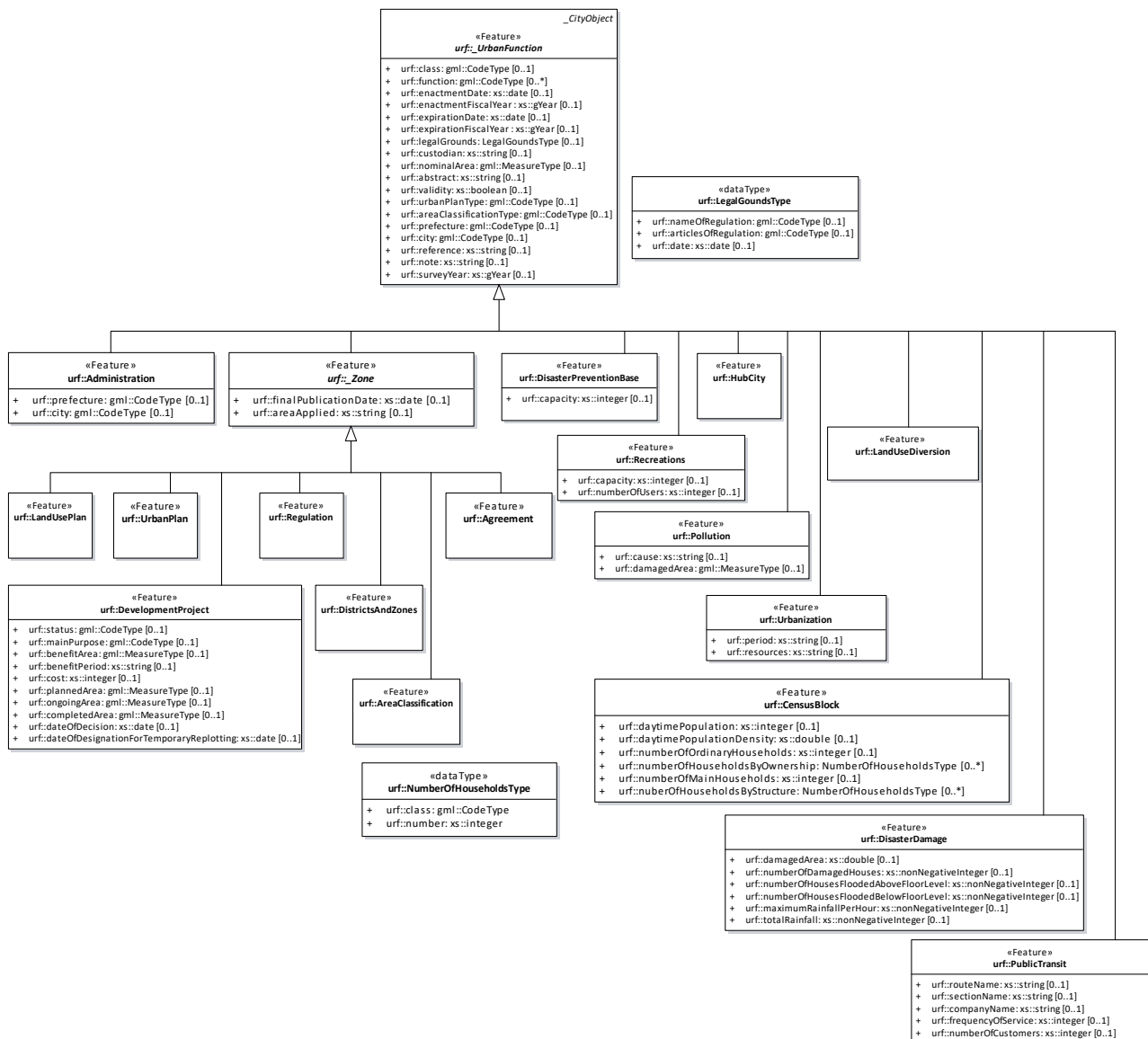


Figure 2-3 Subclasses of *urf::\_UrbanFunction*

#### 4.2.3 AdministrationType, Administration

| Object              | Definition  |
|---------------------|---|
| urf::Administration | Territorial units which an administrative section is divided into |

```

<xs:complexType name="AdministrationType">
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfAdministrationArea" minOccurs="0" maxOccurs="unbounded" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="Administration" type="AdministrationType" substitutionGroup="_UrbanFunction"/>
<xs:element name="_GenericApplicationPropertyOfAdministration" type="xs:anyType" abstract="true"/>
  
```

#### 4.2.4 ZoneType, \_Zone

| Object | Definition |
|--------|------------|
|--------|------------|

|                           |  |
|---------------------------|--|
| urf::_Zone                | Root class of designated area                  |
| Property                  | Definition                                     |
| urf::finalPublicationDate | Final publication date of the zone designation |
| urf::areaApplied          | Name of the area applied                       |

```
<xs:complexType name="ZoneType" abstract="true">
  <xs:annotation>
    <xs:documentation>zoning district</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element name="finalPublicationDate" type="xs:date" minOccurs="0"/>
        <xs:element name="areaApplied" type="xs:string" minOccurs="0"/>
        <xs:element ref="_GenericApplicationPropertyOfZone" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="_Zone" type="ZoneType" abstract="true" substitutionGroup="_UrbanFunction"/>
<xs:element name="_GenericApplicationPropertyOfZone" type="xs:anyType" abstract="true"/>
```

#### 4.2.5 LandUsePlanType, LandUsePlan

| Object           | Definition  |
|------------------|---|
| urf::LandUsePlan | Land use plan designated in accordance with land use regulation |

```
<xs:complexType name="LandUsePlanType">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfLandUsePlan" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="LandUsePlan" type="LandUsePlanType" substitutionGroup="_Zone"/>
<xs:element name="_GenericApplicationPropertyOfLandUsePlan" type="xs:anyType" abstract="true"/>
```

#### 4.2.6 UrbanPlanType, UrbanPlan

| Object         | Definition  |
|----------------|---|
| urf::UrbanPlan | An area designated in accordance with City Planning Act |

```
<xs:complexType name="UrbanPlanType">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfUrbanPlan" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="UrbanPlan" type="UrbanPlanType" substitutionGroup="_Zone"/>
<xs:element name="_GenericApplicationPropertyOfUrbanPlan" type="xs:anyType" abstract="true"/>
```

#### 4.2.7 AgreementType, Agreement

| Object          | Definition  |
|-----------------|---|
| urf:: Agreement | An area specified by the agreement between the parties upon negotiated in order to avoid conflict, competition, etc., |

```
<xs:complexType name="AgreementType" abstract="true">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfAgreement" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="Agreement" type="AgreementType" substitutionGroup="_Zone"/>
<xs:element name="_GenericApplicationPropertyOfAgreement" type="xs:anyType" abstract="true"/>
```

#### 4.2.8 RegulationType, Regulation

| Object           | Definition                                       |
|------------------|--|
| urf:: Regulation | A specified area or location which is regulated. |

```
<xs:complexType name="RegulationType" abstract="true">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfRegulation" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="Regulation" type="RegulationType" substitutionGroup="_Zone"/>
<xs:element name="_GenericApplicationPropertyOfRegulation" type="xs:anyType" abstract="true"/>
```

#### 4.2.9 DevelopmentProjectType, DevelopmentProject

| Object                                       | Definition  |
|--|---|
| urf:: DevelopmentProject                     | Scheduled or developed areas by development project |
| Property                                     | Definition  |
| urf::status                                  | Status of the project                               |
| urf::mainPurpose                             | Purpose of the project                              |
| urf::benefitArea                             | Benefit area by the project                         |
| urf::benefitPeriod                           | Benefit period by the project                       |
| urf::cost                                    | Project cost  |
| urf::plannedArea                             | Planned area in the project                         |
| urf::ongoingArea                             | Ongoing area in the project                         |
| urf::completedArea                           | Completed area in the project                       |
| urf::dateOfDecision                          | Date on which project implementation was decided    |
| urf::dateOfDesignationForTemporaryReplotting | Date on which temporary replotting was designated   |

```
<xs:complexType name="DevelopmentProjectType">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element name="status" type="gml:CodeType" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

```

<xs:element name="mainPurpose" type="gml:CodeType" minOccurs="0"/>
<xs:element name="benefitArea" type="gml:MeasureType" minOccurs="0"/>
<xs:element name="benefitPeriod" type="xs:string" minOccurs="0"/>
<xs:element name="cost" type="xs:integer" minOccurs="0"/>
<xs:element name="plannedArea" type="gml:MeasureType" minOccurs="0"/>
<xs:element name="ongoingArea" type="gml:MeasureType" minOccurs="0"/>
<xs:element name="completedArea" type="gml:MeasureType" minOccurs="0"/>
<xs:element name="dateOfDecision" type="xs:date" minOccurs="0"/>
<xs:element name="dateOfDesignationForTemporaryReplotting" type="xs:date" minOccurs="0"/>
<xs:element ref="_GenericApplicationPropertyOfDevelopmentProject" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:element name="DevelopmentProject" type="DevelopmentProjectType" substitutionGroup="_Zone"/>
<xs:complexType name="DevelopmentProjectPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="DevelopmentProject"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<xs:element name="_GenericApplicationPropertyOfDevelopmentProject" type="xs:anyType" abstract="true"/>

```

#### 4.2.10 AreaClassificationType, AreaClassification

| Object                  | Definition   |
|-------------------------|--|
| urf::AreaClassification | Classification between urbanization promotion areas and urbanization control areas |

```

<xs:complexType name="AreaClassificationType">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfAreaClassification" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="AreaClassification" type="AreaClassificationType" substitutionGroup="_Zone"/>
<xs:element name="_GenericApplicationPropertyOfAreaClassification" type="xs:anyType" abstract="true"/>

```

#### 4.2.11 DistrictsAndZonesType, DistrictsAndZones

| Object                 | Definition   |
|------------------------|--|
| urf::DistrictsAndZones | Districts, zones and blocks established as necessary regarding urban planning area |

```

<xs:complexType name="DistrictsAndZonesType">
  <xs:complexContent>
    <xs:extension base="ZoneType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfDistrictsAndZones" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DistrictsAndZones" type="DistrictsAndZonesType" substitutionGroup="_Zone"/>
<!-- ===== -->

```

```
<xs:element name="_GenericApplicationPropertyOfDistrictsAndZones" type="xs:anyType" abstract="true"/>
```

#### 4.2.12 CensusBlockType, CensusBlock

| Object                             | Definition   |
|------------------------------------|--|
| urf::CensusBlock                   | Census survey unit   |
| Property                           | Definition   |
| urf::daytimePopulation             | Daytime population   |
| urf::daytimePopulationDensity      | Daytime population density   |
| urf::numberOfOrdinaryHousehold     | Total number of ordinary households those who dwell under the same roof and compose a family |
| urf::numberOfHouseholdsByOwnership | Number of households by house ownership  |
| urf::numberOfMainHouseholds        | Number of main households except households living in lodgings                               |
| urf::numberOfHouseholdsByStructure | Number of households by house structure  |

```
<xs:complexType name="CensusBlockType">
  <xs:annotation>
    <xs:documentation>Block for census survey</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element name="daytimePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="daytimePopulationDensity" type="xs:double" minOccurs="0"/>
        <xs:element name="numberOfOrdinaryHouseholds" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfHouseholdsByOwnership" type="NumberOfHouseholdsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element name="numberOfMainHouseholds" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfHouseholdsByStructure" type="NumberOfHouseholdsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element ref="_GenericApplicationPropertyOfCensusBlock" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="CensusBlock" type="CensusBlockType" substitutionGroup="_UrbanFunction"/>
<xs:complexType name="CensusBlockPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="CensusBlock"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfCensusBlock" type="xs:anyType" abstract="true"/>
```

#### NumberOfHouseholdsType

| Type                         | Definition                         |
|------------------------------|------------------------------------|
| urf:: NumberOfHouseholdsType | Number of households by house type |
| Property                     | Definition                         |
| urf::class                   | Type of house ownership            |
| urf::number                  | Number of households               |

```
<xs:element name="NumberOfHouseholds" type="NumberOfHouseholdsType"/>
```

```

<xs:complexType name="NumberOfHouseholdsType">
  <xs:sequence>
    <xs:element name="class" type="gml:CodeType" />
    <xs:element name="number" type="xs:integer" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name="NumberOfHouseholdsPropertyType">
  <xs:sequence>
    <xs:element ref="NumberOfHouseholds" />
  </xs:sequence>
</xs:complexType>

```

#### 4.2.13 DisasterDamageType, DisasterDamage

| Object                                    | Definition                                 |
|---|--|
| urf::DisasterDamage                       | Damaged area or location of disaster       |
| Property                                  | Definition                                 |
| urf::damagedArea                          | Area of the disaster affected area         |
| urf::numberOfDamagedHouses                | Number of houses damaged by the disaster   |
| urf::numberOfHousesFloodedAboveFloorLevel | Number of houses flooded above floor level |
| urf::numberOfHousesFloodedBelowFloorLevel | Number of houses flooded below floor level |
| urf::maximumRainfallPerHour               | Maximum rainfall per hour                  |
| urf::totalRainfall                        | Total rainfall                             |

```

<xs:complexType name="DisasterDamageType">
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element name="damagedArea" type="gml:MeasureType" minOccurs="0" />
        <xs:element name="numberOfDamagedHouses" type="xs:nonNegativeInteger" minOccurs="0" />
        <xs:element name="numberOfHousesFloodedAboveFloorLevel" type="xs:nonNegativeInteger" minOccurs="0" />
        <xs:element name="numberOfHousesFloodedBelowFloorLevel" type="xs:nonNegativeInteger" minOccurs="0" />
        <xs:element name="maximumRainfallPerHour" type="xs:nonNegativeInteger" minOccurs="0" />
        <xs:element name="totalRainfall" type="xs:nonNegativeInteger" minOccurs="0" />
        <xs:element ref="_GenericApplicationPropertyOfDisasterDamage" minOccurs="0" maxOccurs="unbounded" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DisasterDamage" type="DisasterDamageType" substitutionGroup="_UrbanFunction" />
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfDisasterDamage" type="xs:anyType" abstract="true" />

```

#### 4.2.14 PollutionType, Pollution

| Object           | Definition                          |
|------------------|-------------------------------------|
| urf:: Pollution  | Pollution source                    |
| Property         | Definition                          |
| urf::cause       | Description of the pollution source |
| urf::damagedArea | Area of the disaster affected area  |

```

<xs:complexType name="PollutionType">
  <xs:annotation>
    <xs:documentation>Source of pollution</xs:documentation>
  </xs:annotation>

```

```

<xs:complexContent>
  <xs:extension base="UrbanFunctionType">
    <xs:sequence>
      <xs:element name="damagedArea" type="gml:MeasureType" minOccurs="0"/>
      <xs:element name="cause" type="xs:string" minOccurs="0"/>
      <xs:element ref="_GenericApplicationPropertyOfPollution" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Pollution" type="PollutionType" substitutionGroup="_UrbanFunction"/>
<xs:complexType name="PollutionPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="Pollution"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPollution" type="xs:anyType" abstract="true"/>

```

#### 4.2.15 DisasterPreventionBaseType, DisasterPreventionBase

| Object                      | Definition                                       |
|-----------------------------|--|
| urf::DisasterPreventionBase | Off-site center and shelter during disaster      |
| Property                    | Definition                                       |
| urf::capacity               | Maximum number of people who can be accommodated |

```

<xs:complexType name="DisasterPreventionBaseType">
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element name="capacity" type="xs::integer" minOccurs="0"/>
        <xs:element ref="_GenericApplicationPropertyOfDisasterPreventionBase" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DisasterPreventionBase" type="DisasterPreventionBaseType" substitutionGroup="_UrbanFunction"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfDisasterPreventionBase" type="xs:anyType" abstract="true"/>

```

#### 4.2.16 RecreationsType, Recreations

| Object             | Definition                               |
|--------------------|--|
| urf::Recreations   | Facilities for recreation                |
| Property           | Definition                               |
| urf::capacity      | Total area of the facilities             |
| urf::numberOfUsers | Number of annual users of the facilities |

```

<xs:complexType name="RecreationsType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="capacity" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfUsers" type="xs:integer" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfRecreations" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

```

    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Recreations" type="urf:RecreationsType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="RecreationsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:Recreations"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfRecreations" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>

```

#### 4.2.17 HubCityType, HubCity

| Object        | Definition                          |
|---------------|-------------------------------------|
| urf:: HubCity | Regional core urban areas or cities |

```

<xs:complexType name="HubCityType">
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfHubCity" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="HubCity" type="HubCityType" substitutionGroup="_UrbanFunction"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfHubCity" type="xs:anyType" abstract="true"/>

```

#### 4.2.18 LandUseDiversionType, LandUseDiversion

| Object                | Definition            |
|-----------------------|-----------------------|
| urf::LandUseDiversion | Change of the landuse |

```

<xs:complexType name="LandUseDiversionType">
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element ref="_GenericApplicationPropertyOfLandUseDiversion" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="LandUseDiversion" type="LandUseDiversionType" substitutionGroup="_UrbanFunction"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandUseDiversion" type="xs:anyType" abstract="true"/>

```

#### 4.2.19 UrbanizationType, Urbanization

| Object            | Definition                           |
|-------------------|--------------------------------------|
| urf::Urbanization | Change of the urban area             |
| Property          | Definition                           |
| urf::period       | Name of ege or era of the urban area |
| urf::resources    | Name of the resources                |

```
<xs:complexType name="UrbanizationType">
  <xs:complexContent>
    <xs:extension base="UrbanFunctionType">
      <xs:sequence>
        <xs:element name="period" type="xs:string" minOccurs="0"/>
        <xs:element name="resources" type="xs:string" minOccurs="0"/>
        <xs:element ref="_GenericApplicationPropertyOfUrbanization" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Urbanization" type="UrbanizationType" substitutionGroup="_UrbanFunction"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfUrbanization" type="xs:anyType" abstract="true"/>
```

#### 4.2.20 PublicTransitType, PublicTransit

| Type                    | Definition                            |
|-------------------------|---------------------------------------|
| urf::PublicTransit      | Information for public transit        |
| Property                | Definition                            |
| urf::routeName          | Name of the route                     |
| urf::sectionName        | Name of the section                   |
| urf::companyName        | Name of the operating company         |
| urf::frequencyOfService | Number of times for operation per day |
| urf::numberOfCustomers  | Total number of customers per day     |

```
<xs:complexType name="PublicTransitType">
  <xs:sequence>
    <xs:element name="routeName" type="xs:string" minOccurs="0"/>
    <xs:element name="sectionName" type="xs:string" minOccurs="0"/>
    <xs:element name="companyName" type="xs:string" minOccurs="0"/>
    <xs:element name="frequencyOfService" type="xs:integer" minOccurs="0"/>
    <xs:element name="numberOfCustomers" type="xs:double" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:element name="PublicTransit" type="PublicTransitType"/>
<!-- ===== -->
<xs:complexType name="PublicTransitPropertyType">
  <xs:sequence>
    <xs:element ref="PublicTransit"/>
  </xs:sequence>
</xs:complexType>
```

## Annex A (normative)

### XMLSchema Definition

#### A.1 XMLSchema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:urf="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urf/1.3"
xmlns:core="http://www.opengis.net/citygml/2.0" xmlns:grp="http://www.opengis.net/citygml/cityobjectgroup/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gml="http://www.opengis.net/gml"
targetNamespace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urf/1.3"
elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.3.0">
  <xs:annotation>
    <xs:documentation>XML Schema for Urban Function module</xs:documentation>
  </xs:annotation>
  <xs:import namespace="http://www.opengis.net/gml"
schemaLocation="http://schemas.opengis.net/gml/3.1.1/base/gml.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/2.0"
schemaLocation="http://schemas.opengis.net/citygml/2.0/cityGMLBase.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/cityobjectgroup/2.0"
schemaLocation="http://schemas.opengis.net/citygml/cityobjectgroup/2.0/cityObjectGroup.xsd"/>
  <!-- ===== -->
  <!-- ===== CityGML UrbanFunction module ===== -->
  <!-- ===== -->
  <xs:complexType name="UrbanFunctionType" abstract="true">
    <xs:annotation>
      <xs:documentation>The root type for urban function. As subclass of _CityObject, an
        _UrbanFunction inherits all attributes and relations, in particular description, an
        id, names and description from _AbstractFeature. </xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="core:AbstractCityObjectType">
        <xs:sequence>
          <xs:element name="class" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="function" type="gml:CodeType" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element name="enactmentDate" type="xs:date" minOccurs="0"/>
          <xs:element name="enactmentFiscalYear" type="xs:gYear" minOccurs="0"/>
          <xs:element name="expirationDate" type="xs:date" minOccurs="0"/>
          <xs:element name="expirationFiscalYear" type="xs:gYear" minOccurs="0"/>
          <xs:element name="legalGrounds" type="urf:LegalGroundsPropertyType" minOccurs="0"/>
          <xs:element name="custodian" type="xs:string" minOccurs="0"/>
          <xs:element name="nominalArea" type="gml:MeasureType" minOccurs="0"/>
          <xs:element name="abstract" type="xs:string" minOccurs="0"/>
          <xs:element name="validity" type="xs:boolean" minOccurs="0"/>
          <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="reference" type="xs:string" minOccurs="0"/>
          <xs:element name="note" type="xs:string" minOccurs="0"/>
          <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
          <xs:element name="area" type="gml:MultiSurfacePropertyType" minOccurs="0"/>
          <xs:element name="boundary" type="gml:MultiCurvePropertyType" minOccurs="0"/>
          <xs:element name="location" type="gml:MultiPointPropertyType" minOccurs="0"/>
          <xs:element name="target" type="urf:TargetPropertyType" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element ref="urf:_GenericApplicationPropertyOfUrbanFunction" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

```

```

    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="_UrbanFunction" type="urf:UrbanFunctionType" abstract="true"
substitutionGroup="core:_CityObject"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfUrbanFunction" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="LegalGrounds" type="urf:LegalGroundsType"/>
<xs:complexType name="LegalGroundsType">
  <xs:sequence>
    <xs:element name="nameOfRegulation" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="articlesOfRegulation" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="date" type="xs:date" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="LegalGroundsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:LegalGrounds"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="TargetPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="core:_CityObject"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="AdministrationType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfAdministration" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Administration" type="urf:AdministrationType" substitutionGroup="urf:_UrbanFunction"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfAdministration" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="ZoneType" abstract="true">
  <xs:annotation>
    <xs:documentation>zoning district</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">

```

```

<xs:sequence>
  <xs:element name="finalPublicationDate" type="xs:date" minOccurs="0"/>
  <xs:element name="areaApplied" type="xs:string" minOccurs="0"/>
  <xs:element ref="urf:_GenericApplicationPropertyOfZone" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="_Zone" type="urf:ZoneType" abstract="true" substitutionGroup="urf:_UrbanFunction"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfZone" type="xs:anyType" abstract="true"/>
<!-- ===== -->
<xs:complexType name="LandUsePlanType">
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfLandUsePlan" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="LandUsePlan" type="urf:LandUsePlanType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="LandUsePlanPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:LandUsePlan"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandUsePlan" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="UrbanPlanType">
  <xs:annotation>
    <xs:documentation>Urban planning area</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfUrbanPlan" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="UrbanPlan" type="urf:UrbanPlanType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="UrbanPlanPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:UrbanPlan"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfUrbanPlan" type="xs:anyType" abstract="true">

```

```

<xs:annotation>
  <xs:documentation>This element is reserved for future use.</xs:documentation>
</xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="AgreementType">
  <xs:annotation>
    <xs:documentation>Area specified area by the agreement between the parties agreed upon
      and negotiated in order to avoid conflict, competition, etc.,</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfAgreement" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Agreement" type="urf:AgreementType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="AgreementPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:Agreement"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfAgreement" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="RegulationType">
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfRegulation" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Regulation" type="urf:RegulationType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="RegulationPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:Regulation"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfRegulation" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="AreaClassificationType">
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">

```

```

    <xs:sequence>
    <xs:element ref="urf:_GenericApplicationPropertyOfAreaClassification" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="AreaClassification" type="urf:AreaClassificationType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="AreaClassificationPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:AreaClassification"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfAreaClassification" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="DistrictsAndZonesType">
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfDistrictsAndZones" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DistrictsAndZones" type="urf:DistrictsAndZonesType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="DistrictsAndZonesPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:DistrictsAndZones"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfDistrictsAndZones" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="DevelopmentProjectType">
  <xs:complexContent>
    <xs:extension base="urf:ZoneType">
      <xs:sequence>
        <xs:element name="status" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="mainPurpose" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="benefitArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="benefitPeriod" type="xs:string" minOccurs="0"/>
        <xs:element name="cost" type="xs:integer" minOccurs="0"/>
        <xs:element name="plannedArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="ongoingArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="completedArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="dateOfDecision" type="xs:date" minOccurs="0"/>
        <xs:element name="dateOfDesignationForTemporaryReplotting" type="xs:date" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

```

    <xs:element ref="urf:_GenericApplicationPropertyOfDevelopmentProject" minOccurs="0"
maxOccurs="unbounded"/>
  </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DevelopmentProject" type="urf:DevelopmentProjectType" substitutionGroup="urf:_Zone"/>
<xs:complexType name="DevelopmentProjectPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:DevelopmentProject"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfDevelopmentProject" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="CensusBlockType">
  <xs:annotation>
    <xs:documentation>Block for census survey</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="daytimePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="daytimePopulationDensity" type="xs:double" minOccurs="0"/>
        <xs:element name="numberOfOrdinaryHouseholds" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfHouseholdsByOwnership" type="urf:NumberOfHouseholdsPropertyType"
minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="numberOfMainHouseholds" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfHouseholdsByStruture" type="urf:NumberOfHouseholdsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfCensusBlock" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="CensusBlock" type="urf:CensusBlockType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="CensusBlockPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:CensusBlock"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfCensusBlock" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="NumberOfHouseholds" type="urf:NumberOfHouseholdsType"/>
<xs:complexType name="NumberOfHouseholdsType">
  <xs:sequence>
    <xs:element name="class" type="gml:CodeType"/>

```

```

    <xs:element name="number" type="xs:integer"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="NumberOfHouseholdsPropertyType">
  <xs:sequence>
    <xs:element ref="urf:NumberOfHouseholds"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="DisasterDamageType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="damagedArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="numberOfDamagedHouses" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element name="numberOfHousesFloodedAboveFloorLevel" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element name="numberOfHousesFloodedBelowFloorLevel" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element name="maximumRainfallPerHour" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element name="totalRainfall" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfDisasterDamage" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DisasterDamage" type="urf:DisasterDamageType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="DisasterDamagePropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:DisasterDamage"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfDisasterDamage" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="PollutionType">
  <xs:annotation>
    <xs:documentation>Source of pollution</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="damagedArea" type="gml:MeasureType" minOccurs="0"/>
        <xs:element name="cause" type="xs:string" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfPollution" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Pollution" type="urf:PollutionType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="PollutionPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:Pollution"/>
  </xs:sequence>

```

```

<xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPollution" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="DisasterPreventionBaseType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="capacity" type="xs:integer" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfDisasterPreventionBase" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="DisasterPreventionBase" type="urf:DisasterPreventionBaseType"
substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="DisasterPreventionBasePropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:DisasterPreventionBase"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfDisasterPreventionBase" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="RecreationsType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="capacity" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfUsers" type="xs:integer" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfRecreations" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Recreations" type="urf:RecreationsType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="RecreationsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:Recreations"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfRecreations" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>

```

```

</xs:element>
<!-- ===== -->
<xs:complexType name="HubCityType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfHubCity" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="HubCity" type="urf:HubCityType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="HubCityPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:HubCity"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfHubCity" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="LandUseDiversionType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element ref="urf:_GenericApplicationPropertyOfLandUseDiversion" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="LandUseDiversion" type="urf:LandUseDiversionType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="LandUseDiversionPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:LandUseDiversion"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandUseDiversion" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="UrbanizationType">
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="period" type="xs:string" minOccurs="0"/>
        <xs:element name="resources" type="xs:string" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfUrbanization" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

```

</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Urbanization" type="urf:UrbanizationType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="UrbanizationPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:Urbanization"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfUrbanization" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="PublicTransit" type="urf:PublicTransitType" substitutionGroup="urf:_UrbanFunction"/>
<xs:complexType name="PublicTransitType">
  <xs:annotation>
    <xs:documentation>The root type for public transit.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urf:UrbanFunctionType">
      <xs:sequence>
        <xs:element name="routeName" type="xs:string" minOccurs="0"/>
        <xs:element name="sectionName" type="xs:string" minOccurs="0"/>
        <xs:element name="companyName" type="xs:string" minOccurs="0"/>
        <xs:element name="frequencyOfService" type="xs:integer" minOccurs="0"/>
        <xs:element name="numberOfCustomers" type="xs:double" minOccurs="0"/>
        <xs:element ref="urf:_GenericApplicationPropertyOfPublicTransit" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="PublicTransitPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urf:PublicTransit"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPublicTransit" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
</xs:schema>

```

## A.2 Sample data (informative)

```

<?xml version="1.0" encoding="UTF-8"?>
<core:CityModel xmlns:urf="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urf/1.3"
  xmlns:core="http://www.opengis.net/citygml/2.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:xlink="http://www.w3.org/1999/xlink">

```

```

xsi:schemaLocation="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urf/1.3 http://www.kantei.g
o.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/urf/1.3/urbanFunction.xsd
http://www.opengis.net/citygml/2.0 http://schemas.opengis.net/citygml/2.0/cityGMLBase.xsd
http://www.opengis.net/gml http://schemas.opengis.net/gml/3.1.1/base/gml.xsd">
<core:cityObjectMember>
  <urf:Administration gml:id="admin001">
    <urf:prefecture codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Comm
on_prefecture.xml">40</urf:prefecture>
    <urf:city codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_loca
lPublicAuthorities.xml">40220</urf:city>
    <urf:surveyYear>2017</urf:surveyYear>
    <urf:area>
      <gml:MultiSurface srsName="http://www.opengis.net/def/crs/EPSSG/0/6697">
        <gml:surfaceMember>
          <gml:Polygon>
            <gml:exterior>
              <gml:LinearRing>
                <gml:pos>33.84252833 130.4901808 0</gml:pos>
                <gml:pos>33.84259361 130.4903153 0</gml:pos>
<-- omitted -->
                <gml:pos>33.84251389 130.4900461 0</gml:pos>
                <gml:pos>33.84252833 130.4901808 0</gml:pos>
              </gml:LinearRing>
            </gml:exterior>
          </gml:Polygon>
        </gml:surfaceMember>
        <gml:surfaceMember>
          <gml:Polygon>
            <gml:exterior>
              <gml:LinearRing>
                <gml:pos>33.8638502 130.4732692 0</gml:pos>
                <gml:pos>33.86385347 130.473259 0</gml:pos>
<-- omitted -->
                <gml:pos>33.86384941 130.4732781 0</gml:pos>
                <gml:pos>33.8638502 130.4732692 0</gml:pos>
              </gml:LinearRing>
            </gml:exterior>
          </gml:Polygon>
        </gml:surfaceMember>
      </gml:MultiSurface>
    </urf:area>
  </urf:Administration>
</core:cityObjectMember>
</core:CityModel>

```

## Annex B (informative)

### Code lists for Urban Function Data

This annex exemplifies the specification of code lists for enumerative attributes of type *gml:CodeType* in Urban Planning ADE and provides proposals for selected attributes. Please note that this annex is non-normative and the presented code lists are neither mandatory nor complete.

#### Code lists for UrbanFunction

|  |
|--|
| Code list of the subclasses of <i>UrbanFunction</i> attribute <i>urbanPlanType</i> |
| See Code list for the <i>UrbanPlan</i> attribute <i>class</i>                      |

|   |
|---|
| Code list of the subclasses of <i>UrbanFunction</i> attribute <i>areaClassificationType</i> |
| See Code list for the <i>AreaClassification</i> attribute <i>class</i>                      |

|   |
|---|
| Code list of the subclasses of <i>UrbanFunction</i> attribute <i>prefecture</i>   |
| See Code list for the <i>Administration</i> attribute <i>prefecture</i> in Part 2 |

|  |
|--|
| Code list of the subclasses of <i>UrbanFunction</i> attribute <i>city</i>  |
| See Code list of the <i>Administration</i> attribute <i>city</i> in Part 2 |

#### Code lists for Administration

|   |
|---|
| Code list of the <i>Administration</i> attribute <i>prefecture</i>  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_prefecture.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_prefecture.xml</a> |
| Prefecture code defined in international/domestic standard should be used.<br>e.g. JIS X 0401:1973 – Todofuken (prefecture) identification code (in Japan)  |

|   |
|---|
| Code list of the <i>Administration</i> attribute <i>city</i>  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_localPublicAuthorities.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_localPublicAuthorities.xml</a> |
| Municipality code defined in international/domestic standard should be used.<br>e.g. JIS X0402:2010 – Identification code for cities, towns and villages (in Japan)   |

#### Code lists for LandUsePlan

|   |   |      |  |
|---|---|------|--|
| Code list for the <i>LandUsePlan</i> attribute <i>class</i>   |   |      |  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_landUsePlanType.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_landUsePlanType.xml</a> |   |      |  |
| 1010  | special use districts                     | 1140 | scenic district  |
| 1020  | exceptional floor area ratio district     | 1150 | parking place development zone                                 |
| 1030  | special use restriction districts         | 1160 | port zone  |
| 1040  | high-rise residential attraction district | 1170 | special historic natural features conservation zone            |
| 1050  | hight control district                    | 1180 | category 1 special historic natural features conservation zone |

|      |  |      |  |
|------|--|------|--|
| 1060 | high-level use district                              | 1190 | category 2 special historic natural features conservation zone |
| 1070 | specified blocks                                     | 1200 | special green space conservation district                      |
| 1080 | special urban renaissance district                   | 1210 | distribution business zone                                     |
| 1090 | fire prevention district                             | 1220 | productive green zone  |
| 1100 | quasi-fire prevention district                       | 1230 | conservation zone for clusters of traditional structures       |
| 1110 | specified disaster prevention block improvement zone | 1240 | aircraft noise control zone                                    |
| 1120 | landscape zone                                       | 1250 | aircraft noise control special zone                            |
| 1130 | quasi-landscape zone                                 |      |  |

## Code lists for UrbanPlan

|   |                           |      |                                     |
|---|---------------------------|------|-------------------------------------|
| Code list for the <i>UrbanPlan</i> attribute class  |                           |      |                                     |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_urbanPlanType.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_urbanPlanType.xml</a> |                           |      |                                     |
| 1010  | urban planning area       | 1090 | area outside of urban planning area |
| 1020  | quasi urban planning area |      |                                     |

## Code lists for Agreement

|   |                       |      |                     |
|---|-----------------------|------|---------------------|
| Code list for the <i>Agreement</i> attribute class  |                       |      |                     |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Agreement_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Agreement_class.xml</a> |                       |      |                     |
| 1010  | building agreement    | 1030 | landscape agreement |
| 1020  | green space agreement | 1040 | development permit  |

## Code lists for DevelopmentProject

|   |                         |      |                  |
|---|-------------------------|------|------------------|
| Code list for the <i>DevelopmentProject</i> attribute class   |                         |      |                  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_class.xml</a> |                         |      |                  |
| 1010  | housing                 | 1030 | urban facilities |
| 1020  | agricultural facilities |      |                  |

|   |   |      |                        |
|---|---|------|------------------------|
| Code list for the <i>DevelopmentProject</i> attribute function  |   |      |                        |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_function.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_function.xml</a> |   |      |                        |
| 1010  | urban redevelopment project                       | 3010 | urban highway          |
| 1020  | residential area improvement project              | 3020 | road                   |
| 1030  | land readjustment project                         | 3030 | water supply           |
| 1040  | new residential urban development project         | 3040 | sewage                 |
| 1050  | industrial construction project                   | 3050 | park                   |
| 1060  | distribution business complex reclamation project | 3060 | river                  |
| 1070  | housing facility construction project             | 3070 | other urban facilities |
| 1080  | public water surface landfill project             |      |                        |
| 1090  | new urban infrastructure development project      |      |                        |
| 1100  | residential area development project              |      |                        |
| 1110  | disaster control area development project         |      |                        |
| 1120  | other public residential development project      |      |                        |
| 2010  | irrigation and drainage project                   |      |                        |
| 2020  | field development project                         | 9000 | unexamined             |
| 2030  | farm road improvement project                     | 9010 | exception              |
| 2040  | other agricultural project                        | 9020 | unknown                |

|   |  |  |  |
|---|--|--|--|
| Code list for the <i>DevelopmentProject</i> attribute usage   |  |  |  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_usage.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_usage.xml</a> |  |  |  |

|      |                                     |      |            |
|------|-------------------------------------|------|------------|
| 1010 | residential                         | 9000 | unexamined |
| 1020 | commercial                          | 9010 | exception  |
| 1030 | industrial                          | 9020 | unknown    |
| 1040 | agriculture, forestry and fisheries |      |            |
| 1050 | public                              |      |            |
| 1060 | other                               |      |            |

|   |                                |      |            |
|---|--------------------------------|------|------------|
| Code list for the <i>DevelopmentProject</i> attribute <i>status</i>   |                                |      |            |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_status.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DevelopmentProject_status.xml</a> |                                |      |            |
| 1010  | completed                      | 9000 | unexamined |
| 1020  | under construction or approved | 9010 | exception  |
|   |                                | 9020 | unknown    |

## Code lists for AreaClassification

|   |  |      |                                     |
|---|--|------|-------------------------------------|
| Code list for AreaClassification attribute <i>class</i>   |  |      |                                     |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_areaClassification.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_areaClassification.xml</a> |  |      |                                     |
| 1010  | undesignated area within an undivided use district | 1040 | undivided use district              |
| 1020  | urbanization area                                  | 1050 | quasi- urban planning area          |
| 1003  | urbanization control area                          | 1090 | area outside of urban planning area |

## Code lists for DistrictsAndZones

|   |   |      |                                   |
|---|---|------|-----------------------------------|
| Code list for the <i>DistrictsAndZones</i> attribute <i>class</i>   |   |      |                                   |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_districtsAndZones.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_districtsAndZones.xml</a> |   |      |                                   |
| 1000  | undesignated area   | 1070 | quasi-residential district        |
| 1010  | category 1 low-rise exclusive residential district            | 1080 | neighbourhood commercial district |
| 1020  | category 2 low-rise exclusive residential district            | 1090 | commercial district               |
| 1030  | category 1 medium-to-high-rise exclusive residential district | 1100 | quasi-industrial district         |
| 1040  | category 2 medium-to-high-rise exclusive residential district | 1110 | industrial district               |
| 1050  | category 1 residential district                               | 1120 | exclusive industrial district     |
| 1060  | category 2 residential district                               | 1130 | rural residential district        |

## Code lists for CensusBlock

|   |                        |      |              |
|---|------------------------|------|--------------|
| Code list for the <i>CensusBlock</i> attribute <i>numberOfHouseholdsByOwnership</i> (attribute <i>class</i> of the datatype <i>NumberOfHouseholdsType</i> )   |                        |      |              |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Households_ownershipType.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Households_ownershipType.xml</a> |                        |      |              |
| 1000  | own occupation         | 1030 | issued house |
| 1010  | leased house (public)  | 1040 | lodging      |
| 1020  | leased house (private) | 1050 | others       |

|   |                        |      |                                 |
|---|------------------------|------|---------------------------------|
| Code list for the <i>CensusBlock</i> attribute <i>numberOfHouseholdsByStructure</i> (attribute <i>class</i> of the datatype <i>NumberOfHouseholdsType</i> )   |                        |      |                                 |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Households_houseType.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Households_houseType.xml</a> |                        |      |                                 |
| 1000  | single-family home     | 1040 | apartment (6-10 floors)         |
| 1010  | tenement house         | 1050 | apartment (more than 11 floors) |
| 1020  | apartment (1-2 floors) | 1060 | others                          |
| 1030  | apartment (3-5 floors) |      |                                 |

## Code lists for DisasterDamage

|   |       |      |           |
|---|-------|------|-----------|
| Code list for the <i>DisasterDamage</i> attribute <i>class</i>  |       |      |           |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DisasterDamage_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DisasterDamage_class.xml</a> |       |      |           |
| 1010  | flood | 1020 | landslide |

|   |                            |      |            |
|---|----------------------------|------|------------|
| Code list for the <i>DisasterDamage</i> attribute <i>function</i>   |                            |      |            |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DisasterDamage_function.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DisasterDamage_function.xml</a> |                            |      |            |
| 1000  | external water damage area | 2010 | rock slide |
| 1020  | internal water damage area | 2020 | landslide  |
|   |                            | 2030 | mudflow    |

## Code lists for Pollution

|   |                               |      |                    |
|---|-------------------------------|------|--------------------|
| Code list for <i>Pollution</i> attribute <i>class</i>   |                               |      |                    |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Pollution_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Pollution_class.xml</a> |                               |      |                    |
| 1010  | air pollution                 | 1050 | ground subsidence  |
| 1020  | water pollution               | 1060 | odious smell       |
| 1030  | noise                         | 1070 | soil contamination |
| 1040  | shocks, tremors or vibrations | 1080 | other              |

## Code lists for DisasterPreventionBase

|   |                                       |      |                               |
|---|---------------------------------------|------|-------------------------------|
| Code list for the <i>DisasterPreventionBase</i> attribute <i>class</i>  |                                       |      |                               |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DisasterPreventionBase_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/DisasterPreventionBase_class.xml</a> |                                       |      |                               |
| 1010  | designated emergency evacuation place | 1030 | disaster prevention base      |
| 1020  | designated evacuation place           | 1040 | water supply for fire defense |

## Code lists for Recreations

|   |                   |      |                  |
|---|-------------------|------|------------------|
| Code list for the <i>Recreations</i> attribute <i>class</i>   |                   |      |                  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Recreation_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Recreation_class.xml</a> |                   |      |                  |
| 1010  | nature            | 1100 | life / industry  |
| 1020  | history / culture | 1120 | view             |
|   |                   | 2000 | other recreation |

|   |                                |      |                       |
|---|--------------------------------|------|-----------------------|
| Code list for the <i>Recreations</i> attribute <i>function</i>  |                                |      |                       |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Recreation_function.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Recreation_function.xml</a> |                                |      |                       |
| 1010  | baseball stadium               | 1110 | pleasure land         |
| 1020  | athletic field                 | 1120 | zoo                   |
| 1030  | soccer field, rugby playground | 1130 | botanical garden      |
| 1040  | tennis court                   | 1140 | cycling stadium, turf |
| 1050  | golf course                    | 1150 | sightseeing toll road |
| 1060  | swimming pool                  | 1160 | cycling course        |
| 1070  | other sports facilities        | 1170 | hiking trail, trail   |
| 1080  | speedboat racecourse           | 1180 | nature trail          |
| 1090  | yacht basin                    | 1190 | camping ground        |
| 1100  | beach, clam digging area       | 1200 | others                |

## Code lists for HubCity

|   |                   |      |          |
|---|-------------------|------|----------|
| Code list for the <i>HubCity</i> attribute <i>class</i>   |                   |      |          |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/HubCity_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/HubCity_class.xml</a> |                   |      |          |
| 1010  | Regional hub city | 1020 | Hub city |

## Code lists for LandUseDiversification

|   |                                 |      |              |
|---|---------------------------------|------|--------------|
| Code list for the <i>LandUseDiversification</i> attribute <i>class</i>  |                                 |      |              |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandUseDiversification_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandUseDiversification_class.xml</a> |                                 |      |              |
| 1010  | conversion of agricultural land | 1030 | new building |
| 1020  | conversion of forestry          |      |              |

|  |  |  |  |
|--|--|--|--|
| Code list for the <i>LandUseDiversification</i> attribute <i>usage</i> |  |  |  |
| See Code list for the DevelopmentProject attribute <i>usage</i>        |  |  |  |

## Code lists for Urbanization

|   |                           |      |                            |
|---|---------------------------|------|----------------------------|
| Code list for the <i>Urbanization</i> attribute <i>class</i>  |                           |      |                            |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Urbanization_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Urbanization_class.xml</a> |                           |      |                            |
| 1010  | mid-Meiji era (1880's)    | 1040 | before World War II        |
| 1020  | early Taisho era (1910's) | 1050 | after World War II         |
| 1030  | early Showa era (1930's)  | 1060 | 30's of Showa era (1950's) |

## Code lists for PublicTransit

|   |          |      |           |
|---|----------|------|-----------|
| Code list for the <i>PublicTransit</i> attribute <i>class</i>   |          |      |           |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PublicTransit_class.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PublicTransit_class.xml</a> |          |      |           |
| 1010  | bus stop | 1020 | bus route |

## Part 3. Statistical Grid Data Encoding Specification

### 1. Scope

To grasp the current situation and issues of urban areas, comparing urban growth from the past to the present and also comparing between cities of the same urban scale are necessary to simplify complex situations.

This document defines statistical grid for time-series comparison and regional comparison, and specifies the encoding format of statistical grid.

In addition, global city model of national or world is necessary for comparing cities and understanding the relationships between cities through quantitative assessment. This is necessary in order to clarify the current situation and problems in urban areas.

The Levels of Detail (LOD) defined in CityGML do not cover such a rough description, therefore this document defines the mechanism to describe the global city model and specifies the encoding format of the information.

### 2. Normative references

Followings are normative references of this document.

- OpenGIS® OGC City Geography Markup Language (CityGML) Encoding Standard, Version 2.0, OGC document 12-019

### 3. Conventions

#### 3.1 Terms and definitions

No terms and definitions are listed in this document.

#### 3.2 Abbreviated terms

ADE Application Domain Extensions

CityGML City Geography Markup Language

GML Geography Markup Language

LOD Levels Of Detail

OGC Open Geospatial Consortium

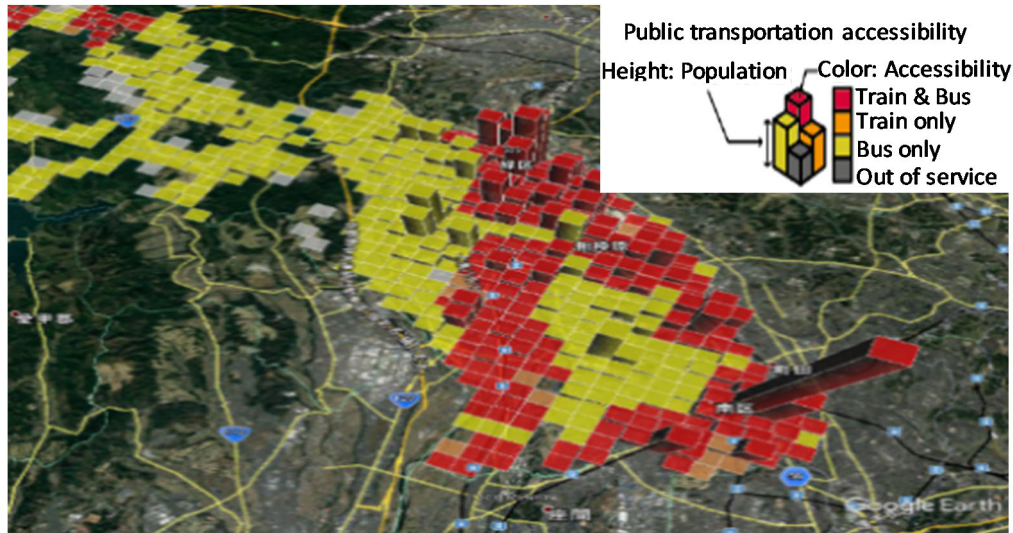
UML Unified Modeling Language

### 4. Statistical Grid Data Encoding

#### 4.1 Overview

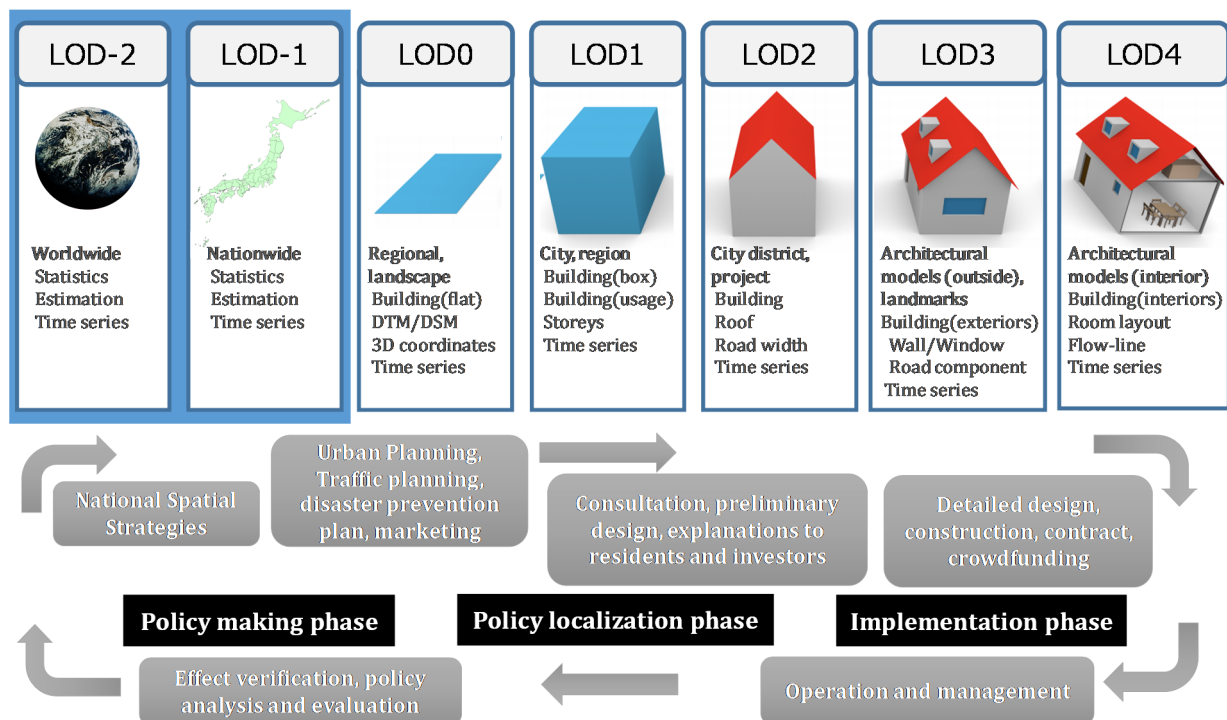
In city planning, characteristics of features are abstracted and mapped into statistical units for global representation and analysis. An Administrative boundary is often used as a statistical unit. However, changes of administrative boundaries such as municipal mergers and dissolutions make it difficult to conduct time-series comparison and regional comparison. In addition, different sizes of administrative

districts hinder finding regional issues. A Statistical grid which divides cities into grid cells with almost equal area are useful for such global analysis. Therefore this module extends LODs to describe such rough city models which do not have to be detailed but should be described with a unified unit among cities. This enables users to analyse and visualise cities under the same conditions. Figure 3-1 shows an example of grid cells describing a global city model.



**Figure 3-1 Example of grids describing a global city model**

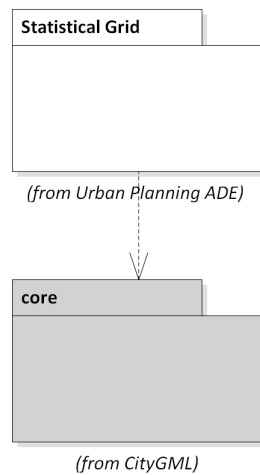
This module defines two additional LODs for statistical grids, LOD-1 (minus one) for nationwide city models and LOD-2 (minus two) for worldwide city models. This extension allows users to compare different times of a city and among different cities with statistical grids without inconsistency between LOD 0 to 4 (Figure 3-2).



**Figure 3-2 Extended LOD for global city models**

Based on the above, this document defines the elements and types according to the rules of Application Domain Extensions (ADE) which describe statistical grid for global city models but not defined in CityGML. Those already defined in CityGML are imported without any inconsistency.

Figure 3-3 shows the structure of Statistical Grid Data.



**Figure 3-3 Package diagram of Statistical Grid Data**

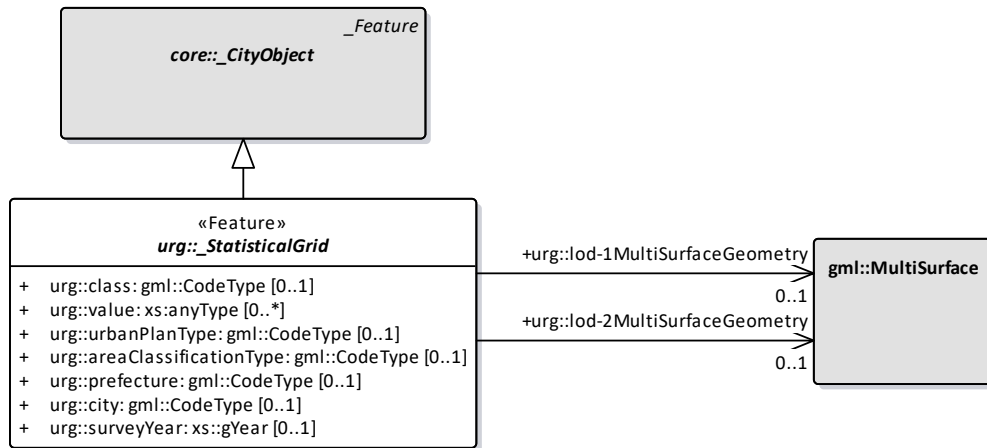
|                                     |   |
|-------------------------------------|---|
| <b>Module name</b>                  | Statistical Grid  |
| <b>XML namespace identifier</b>     | <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urg/1.3">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urg/1.3</a>   |
| <b>XMLSchema location</b>           | <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/urg/1.3/statisticalGrid.xsd">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/urg/1.3/statisticalGrid.xsd</a> |
| <b>Recommended namespace prefix</b> | urg   |
| <b>Description</b>                  | This module defines statistical grid which divides specific area to grids. Each grid has its own thematic value, e.g. population, land price.   |

## 4.2 Object definition

### 4.2.1 StatisticalGridType, \_StatisticalGrid

The Statistical grid module enables users with time-series analysis and regional comparison. A grid is a network composed of two or more sets of curves, in which the members of each set intersect the members of the other sets in an algorithmic way, and the curves separate space into grid cells. Statistical grid module gives statistical values to each grid cell.

Figure 3-4 shows the UML diagram of the Statistical grid module, and the XMLSchema Definition is attached in Annex A. A root class of this module is *urg::\_StatisticalGrid*. A grid cell defined in Coverage schema is not distinguishable and is regarded as a part of a feature, however a statistical grid cell has its identifier. This means a statistical grid cell is a feature rather than a part of a feature, and therefore *urg::\_StatisticalGrid* inherits from *gml::\_Feature* via *core::\_CityObject*.



**Figure 3-4 UML diagram of Statistical Grid Data**

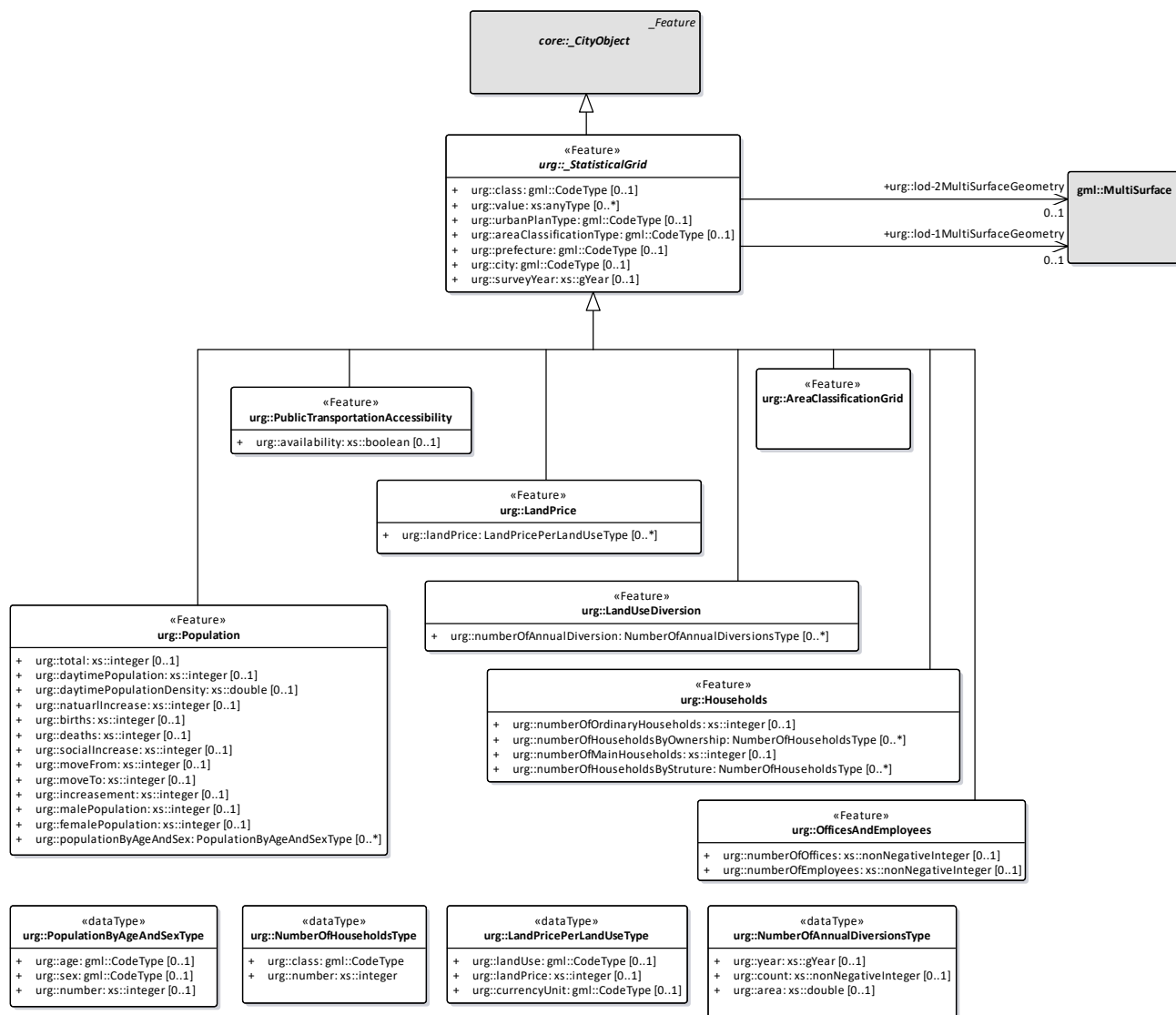
| Object                         | Definition  |
|--------------------------------|---|
| urg::_StatisticalGrid          | grid cell for statistical data                                  |
| Property                       | Definition  |
| urg::class                     | type of the mesh  |
| urg::value                     | value of the mesh   |
| urg::urbanPlanType             | Type of the grid location designated by the Urban Plan          |
| urg::areaClassificationType    | Type of the grid location designated by the Area classification |
| urg::prefecture                | Prefecture name of the grid location                            |
| urg::city                      | City name of the grid location                                  |
| urg::surveyYear                | year of the survey  |
| urg::lod-1MultiSurfaceGeometry | geometry of the mesh at LOD-1 level                             |
| urg::lod-2MultiSurfaceGeometry | geometry of the mesh at LOD-2 level                             |

```

<xs:complexType name="StatisticalGridType" abstract="true">
  <xs:complexContent>
    <xs:extension base="core:AbstractCityObjectType">
      <xs:sequence>
        <xs:element name="class" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="value" type="xs:anyType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
        <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
        <xs:element name="lod-1MultiSurfaceGeometry" type="gml:MultiSurfacePropertyType" minOccurs="0"/>
        <xs:element name="lod-2MultiSurfaceGeometry" type="gml:MultiSurfacePropertyType" minOccurs="0"/>
        <xs:element ref="_GenericApplicationPropertyOfStatisticalGrid" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="_StatisticalGrid" type="StatisticalGridType" abstract="true" substitutionGroup="core:_CityObject"/>
<xs:element name="_GenericApplicationPropertyOfStatisticalGrid" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
  
```

The elements “\_GenericApplicationPropertyOf...”. “\_GenericApplicationPropertyOf...” are reserved for future use and not used in this document.

A *urg::\_StatisticalGrid* is the root class of this module and is extended for defining specific statistical grid objects. Figure 3-5 shows subclasses of *urg::\_StatisticalGrid*.



**Figure 3-5 Subclasses of *urg::\_StatisticalGrid***

#### 4.2.2 PopulationType, Population

| Object                        | Definition                            |
|-------------------------------|---------------------------------------|
| urg::Population               | Population information in a grid cell |
| Property                      | Definition                            |
| urg::total                    | Total population                      |
| urg::daytimePopulation        | Daytime population                    |
| urg::daytimePopulationDensity | Daytime population density            |
| urg::naturalIncrease          | Natural increase per year             |
| urg::births                   | Number of births                      |
| urg::deaths                   | Number of deaths                      |

|                             |                                |
|-----------------------------|--------------------------------|
| urg::socialIncrease         | Increase of social community   |
| urg::moveFrom               | Number of people who move from |
| urg::moveTo                 | Number of people who move to   |
| urg::increasement           | Population increase            |
| urg::malePopulation         | Total male population          |
| urg::femalePopulation       | Total female population        |
| urg:: populationByAgeAndSex | Population by age and sex      |

```

<xs:complexType name="PopulationType">
  <xs:annotation>
    <xs:documentation>grid cell with population values</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="StatisticalGridType">
      <xs:sequence>
        <xs:element name="total" type="xs:integer" minOccurs="0"/>
        <xs:element name="daytimePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="daytimePopulationDensity" type="xs:double" minOccurs="0"/>
        <xs:element name="naturalIncrease" type="xs:integer" minOccurs="0"/>
        <xs:element name="births" type="xs:integer" minOccurs="0"/>
        <xs:element name="deaths" type="xs:integer" minOccurs="0"/>
        <xs:element name="socialIncrease" type="xs:integer" minOccurs="0"/>
        <xs:element name="moveFrom" type="xs:integer" minOccurs="0"/>
        <xs:element name="moveTo" type="xs:integer" minOccurs="0"/>
        <xs:element name="increasement" type="xs:integer" minOccurs="0"/>
        <xs:element name="malePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="femalePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="populationByAgeAndSex" type="PopulationByAgeAndSexPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element ref="_GenericApplicationPropertyOfPopulation" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Population" type="PopulationType" substitutionGroup="_StatisticalGrid"/>
<xs:complexType name="PopulationPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="Population"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPopulation" type="xs:anyType" abstract="true"/>

```

### *PopulationByAgeAndSexType*

| Type                           | Definition                |
|--------------------------------|---------------------------|
| urg::PopulationByAgeAndSexType | Population by age and sex |
| Property                       | Definition                |
| urg::age                       | Age                       |
| urg::sex                       | Sex                       |
| urg::number                    | population                |

```

<xs:element name="PopulationByAgeAndSex" type="PopulationByAgeAndSexType"/>
<xs:complexType name="PopulationByAgeAndSexType">
  <xs:sequence>

```

```

<xs:element name="age" type="gml:CodeType" minOccurs="0"/>
<xs:element name="sex" type="gml:CodeType" minOccurs="0"/>
<xs:element name="number" type="xs:integer" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="PopulationByAgeAndSexPropertyType">
  <xs:sequence>
    <xs:element ref="PopulationByAgeAndSex"/>
  </xs:sequence>
</xs:complexType>

```

#### 4.2.3 PublicTransportationAccessibilityType, PublicTransportationAccessibility

| Object                                 | Definition  |
|--|---|
| urg::PublicTransportationAccessibility | Accessibility of public transportation service such as busses and railways                              |
| Property                               | Definition  |
| urg::availability                      | Whether the grid cell location is within the specified distance from the bus stop/ train station or not |

```

<xs:complexType name="PublicTransportationAccessibilityType">
  <xs:complexContent>
    <xs:extension base="StatisticalGridType">
      <xs:sequence>
        <xs:element name="availability" type="xs:boolean" minOccurs="0"/>
        <xs:element ref="_GenericApplicationPropertyOfPublicTransportationAccessibility" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="PublicTransportationAccessibility" type="PublicTransportationAccessibilityType"
substitutionGroup="_StatisticalGrid"/>
<xs:complexType name="PublicTransportationAccessibilityPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="PublicTransportationAccessibility"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPublicTransportationAccessibility" type="xs:anyType"
abstract="true"/>

```

#### 4.2.4 LandPriceType, LandPrice

| Object         | Definition                                 |
|----------------|--|
| urg::LandPrice | Average land price in a grid cell          |
| Property       | Definition                                 |
| urg::landPrice | land price per unit area by land use types |

```

<xs:complexType name="LandPriceType">
  <xs:annotation>
    <xs:documentation>grid cell with land prices</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="StatisticalGridType">

```

```

<xs:sequence>
  <xs:element name="landPrice" type="LandPricePerLandUsePropertyType" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element ref="_GenericApplicationPropertyOfLandPrice" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="LandPrice" type="LandPriceType" substitutionGroup="_StatisticalGrid"/>
<xs:complexType name="LandPricePropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="LandPrice"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandPrice" type="xs:anyType" abstract="true"/>

```

### *LandPricePerLandUseType*

| Type                          | Definition   |
|-------------------------------|--|
| urg:: LandPricePerLandUseType | Land price per unit area of the specified land use |
| Property                      | Definition   |
| urg::landUse                  | Land use type                                      |
| urg::landPrice                | Land price per unit area                           |
| urg::currencyUnit             | Currency unit for the price                        |

```

<xs:element name="LandPricePerLandUse" type="LandPricePerLandUseType"/>
<xs:complexType name="LandPricePerLandUseType">
  <xs:sequence>
    <xs:element name="landUse" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="landPrice" type="xs:integer" minOccurs="0"/>
    <xs:element name="currencyUnit" type="gml:CodeType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="LandPricePerLandUsePropertyType">
  <xs:sequence>
    <xs:element ref="LandPricePerLandUse"/>
  </xs:sequence>
</xs:complexType>

```

### 4.2.5 LandUseDiversionType, LandUseDiversion

| Object                       | Definition                               |
|------------------------------|--|
| urg:: LandUseDiversion       | Land use diversion per year              |
| Property                     | Definition                               |
| urg::numberOfAnnualDiversion | Annual number and area of land diversion |

```

<xs:complexType name="LandUseDiversionType">
  <xs:complexContent>
    <xs:extension base="StatisticalGridType">
      <xs:sequence>
        <xs:element name="numberOfAnnualDiversion" type="NumberOfAnnualDivisionsPropertyType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element ref="_GenericApplicationPropertyOfLandUseDiversion" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>

```

```

</xs:complexType>
<!-- ===== -->
<xs:element name="LandUseDiversions" type="LandUseDiversionsType" substitutionGroup="_StatisticalGrid"/>
<xs:complexType name="LandUseDiversionsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="LandUseDiversions"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandUseDiversions" type="xs:anyType" abstract="true"/>

```

### NumberOfAnnualDiversionsType

| Type                              | Definition                                  |
|-----------------------------------|---|
| urg::NumberOfAnnualDiversionsType | Number of diversion and total area per year |
| Property                          | Definition                                  |
| urg::year                         | Survey year                                 |
| urg::count                        | number of land diversion                    |
| urg::area                         | total area                                  |

```

<xs:element name="NumberOfAnnualDiversions" type="NumberOfAnnualDiversionsType"/>
<xs:complexType name="NumberOfAnnualDiversionsType">
  <xs:sequence>
    <xs:element name="year" type="xs:gYear" minOccurs="0"/>
    <xs:element name="count" type="xs:nonNegativeInteger" minOccurs="0"/>
    <xs:element name="area" type="gml:MeasureType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="NumberOfAnnualDiversionsPropertyType">
  <xs:sequence>
    <xs:element ref="NumberOfAnnualDiversions"/>
  </xs:sequence>
</xs:complexType>

```

### 4.2.6 HouseholdsType, Households

| Object                             | Definition   |
|------------------------------------|--|
| urg::Households                    | Number of households by ownership and building structure |
| Property                           | Definition   |
| urg::numberOfOrdinaryHouseholds    | Number of ordinary households                            |
| urg::numberOfMainHouseholds        | Number of main households                                |
| urg::numberOfHouseholdsByOwnership | Number of households by ownership                        |
| urg::numberOfHouseholdsByStructure | Number of households by building structure               |

```

<xs:complexType name="HouseholdsType">
  <xs:annotation>
    <xs:documentation>grid cell with the number of households</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="StatisticalGridType">
      <xs:sequence>
        <xs:element name="numberOfOrdinaryHousehold" type="xs:integer"/>
        <xs:element name="numberOfHouseholdsByOwnership" type="NumberOfHouseholdsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>

```

```

    <xs:element name="numberOfHouseholdsByStructure" type="NumberOfHouseholdsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
    <xs:element name="numberOfMainHousehold" type="xs:integer"/>
    <xs:element ref="_GenericApplicationPropertyOfHouseholds" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Households" type="HouseholdsType" substitutionGroup="_StatisticalGrid"/>
<xs:complexType name="HouseholdsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="Households"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfHouseholds" type="xs:anyType" abstract="true"/>

```

### NumberOfHouseholdsType

| Type                         | Definition                   |
|------------------------------|------------------------------|
| urg:: NumberOfHouseholdsType | Number of households by type |
| Property                     | Definition                   |
| urg::class                   | Type of household            |
| urg::number                  | Number of households         |

```

<xs:element name="NumberOfHouseholds" type="NumberOfHouseholdsType"/>
<xs:complexType name="NumberOfHouseholdsType">
  <xs:sequence>
    <xs:element name="class" type="gml:CodeType"/>
    <xs:element name="number" type="xs:integer"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="NumberOfHouseholdsPropertyType">
  <xs:sequence>
    <xs:element ref="NumberOfHouseholds"/>
  </xs:sequence>
</xs:complexType>

```

### 4.2.7 OfficesAndEmployeesType, OfficesAndEmployees

| Object                    | Definition                                |
|---------------------------|---|
| urg:: OfficesAndEmployees | Number of offices and employees in a mesh |
| Property                  | Definition                                |
| urg::numberOfOffices      | Number of offices                         |
| urg::numberOfEmployees    | Number of employees                       |

```

<xs:complexType name="OfficesAndEmployeesType">
  <xs:complexContent>
    <xs:extension base="StatisticalGridType">
      <xs:sequence>
        <xs:element name="numberOfOffices" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element name="numberOfEmployees" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element ref="_GenericApplicationPropertyOfOfficesAndEmployees" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

```
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="OfficesAndEmployees" type="OfficesAndEmployeesType" substitutionGroup="_StatisticalGrid"/>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfOfficesAndEmployees" type="xs:anyType" abstract="true"/>
```

## Annex A (normative)

### XMLSchema Definition

#### A.1 XMLSchema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:urg="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urg/1.3"
xmlns:core="http://www.opengis.net/citygml/2.0" xmlns:grp="http://www.opengis.net/citygml/cityobjectgroup/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gml="http://www.opengis.net/gml"
targetNamespace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urg/1.3"
elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.3.0">
  <xs:annotation>
    <xs:documentation>XML Schema for Statistical Grid module</xs:documentation>
  </xs:annotation>
  <xs:import namespace="http://www.opengis.net/gml"
schemaLocation="http://schemas.opengis.net/gml/3.1.1/base/gml.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/2.0"
schemaLocation="http://schemas.opengis.net/citygml/2.0/cityGMLBase.xsd"/>
  <xs:import namespace="http://www.opengis.net/citygml/cityobjectgroup/2.0"
schemaLocation="http://schemas.opengis.net/citygml/cityobjectgroup/2.0/cityObjectGroup.xsd"/>
  <!-- ===== -->
  <!-- ===== CityGML StatisticalGrid module ===== -->
  <!-- ===== -->
  <xs:complexType name="StatisticalGridType" abstract="true">
    <xs:annotation>
      <xs:documentation>The root type for statistical grid. As subclass of _CityObject, an
        _StatisticalGrid inherits all attributes and relations, in particular a description,
        an id and names. </xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="core:AbstractCityObjectType">
        <xs:sequence>
          <xs:element name="class" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="value" type="xs:anyType" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element name="urbanPlanType" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="areaClassificationType" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="prefecture" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="city" type="gml:CodeType" minOccurs="0"/>
          <xs:element name="surveyYear" type="xs:gYear" minOccurs="0"/>
          <xs:element name="lod-1MultiSurfaceGeometry" type="gml:MultiSurfacePropertyType" minOccurs="0"/>
          <xs:element name="lod-2MultiSurfaceGeometry" type="gml:MultiSurfacePropertyType" minOccurs="0"/>
          <xs:element ref="urg:_GenericApplicationPropertyOfStatisticalGrid" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <!-- ===== -->
  <xs:element name="_StatisticalGrid" type="urg:StatisticalGridType" abstract="true"
substitutionGroup="core:_CityObject"/>
  <!-- ===== -->
  <xs:element name="_GenericApplicationPropertyOfStatisticalGrid" type="xs:anyType" abstract="true">
    <xs:annotation>
      <xs:documentation>This element is reserved for future use.</xs:documentation>
    </xs:annotation>
  </xs:element>
```

```

<!-- ===== -->
<xs:complexType name="PopulationType">
  <xs:annotation>
    <xs:documentation>grid cell with population values</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urg:StatisticalGridType">
      <xs:sequence>
        <xs:element name="total" type="xs:integer" minOccurs="0"/>
        <xs:element name="daytimePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="daytimePopulationDensity" type="xs:double" minOccurs="0"/>
        <xs:element name="naturalIncrease" type="xs:integer" minOccurs="0"/>
        <xs:element name="births" type="xs:integer" minOccurs="0"/>
        <xs:element name="deaths" type="xs:integer" minOccurs="0"/>
        <xs:element name="socialIncrease" type="xs:integer" minOccurs="0"/>
        <xs:element name="moveFrom" type="xs:integer" minOccurs="0"/>
        <xs:element name="moveTo" type="xs:integer" minOccurs="0"/>
        <xs:element name="increasement" type="xs:integer" minOccurs="0"/>
        <xs:element name="malePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="femalePopulation" type="xs:integer" minOccurs="0"/>
        <xs:element name="populationByAgeAndSex" type="urg:PopulationByAgeAndSexPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element ref="urg:_GenericApplicationPropertyOfPopulation" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Population" type="urg:PopulationType" substitutionGroup="urg:_StatisticalGrid"/>
<xs:complexType name="PopulationPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urg:Population"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPopulation" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="PopulationByAgeAndSex" type="urg:PopulationByAgeAndSexType"/>
<xs:complexType name="PopulationByAgeAndSexType">
  <xs:sequence>
    <xs:element name="age" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="sex" type="gml:CodeType" minOccurs="0"/>
    <xs:element name="number" type="xs:integer" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="PopulationByAgeAndSexPropertyType">
  <xs:sequence>
    <xs:element ref="urg:PopulationByAgeAndSex"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="PublicTransportationAccessibilityType">
  <xs:annotation>
    <xs:documentation>grid cell to describe areas where the public transportation service is

```

```

    available</xs:documentation>
</xs:annotation>
<xs:complexContent>
  <xs:extension base="urg:StatisticalGridType">
    <xs:sequence>
      <xs:element name="availability" type="xs:boolean" minOccurs="0"/>
      <xs:element ref="urg:_GenericApplicationPropertyOfPublicTransportationAccessibility" minOccurs="0"
maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="PublicTransportationAccessibility" type="urg:PublicTransportationAccessibilityType"
substitutionGroup="urg:_StatisticalGrid"/>
<xs:complexType name="PublicTransportationAccessibilityPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urg:PublicTransportationAccessibility"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfPublicTransportationAccessibility" type="xs:anyType"
abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:complexType name="LandPriceType">
  <xs:annotation>
    <xs:documentation>grid cell with land prices</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urg:StatisticalGridType">
      <xs:sequence>
        <xs:element name="landPrice" type="urg:LandPricePerLandUsePropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element ref="urg:_GenericApplicationPropertyOfLandPrice" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="LandPrice" type="urg:LandPriceType" substitutionGroup="urg:_StatisticalGrid"/>
<xs:complexType name="LandPricePropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urg:LandPrice"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandPrice" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="LandPricePerLandUse" type="urg:LandPricePerLandUseType"/>
<xs:complexType name="LandPricePerLandUseType">

```

```

<xs:sequence>
  <xs:element name="landUse" type="gml:CodeType" minOccurs="0"/>
  <xs:element name="landPrice" type="xs:integer" minOccurs="0"/>
  <xs:element name="currencyUnit" type="gml:CodeType" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="LandPricePerLandUsePropertyType">
  <xs:sequence>
    <xs:element ref="urg:LandPricePerLandUse"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="LandUseDiversionType">
  <xs:annotation>
    <xs:documentation>grid cell with the number and area of land use
      diversion</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="urg:StatisticalGridType">
      <xs:sequence>
        <xs:element name="numberOfAnnualDiversion" type="urg:NumberOfAnnualDiversionsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element ref="urg:_GenericApplicationPropertyOfLandUseDiversion" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="LandUseDiversion" type="urg:LandUseDiversionType" substitutionGroup="urg:_StatisticalGrid"/>
<xs:complexType name="LandUseDiversionPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urg:LandUseDiversion"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfLandUseDiversion" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="NumberOfAnnualDiversions" type="urg:NumberOfAnnualDiversionsType"/>
<xs:complexType name="NumberOfAnnualDiversionsType">
  <xs:sequence>
    <xs:element name="year" type="xs:gYear" minOccurs="0"/>
    <xs:element name="count" type="xs:nonNegativeInteger" minOccurs="0"/>
    <xs:element name="area" type="gml:MeasureType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="NumberOfAnnualDiversionsPropertyType">
  <xs:sequence>
    <xs:element ref="urg:NumberOfAnnualDiversions"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="HouseholdsType">
  <xs:annotation>
    <xs:documentation>grid cell with the number of households</xs:documentation>

```

```

</xs:annotation>
<xs:complexContent>
  <xs:extension base="urg:StatisticalGridType">
    <xs:sequence>
      <xs:element name="numberOfOrdinaryHousehold" type="xs:integer"/>
      <xs:element name="numberOfHouseholdsByOwnership" type="urg:NumberOfHouseholdsPropertyType"
minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="numberOfHouseholdsByStructure" type="urg:NumberOfHouseholdsPropertyType" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="numberOfMainHousehold" type="xs:integer"/>
      <xs:element ref="urg:_GenericApplicationPropertyOfHouseholds" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="Households" type="urg:HouseholdsType" substitutionGroup="urg:_StatisticalGrid"/>
<xs:complexType name="HouseholdsPropertyType">
  <xs:sequence minOccurs="0">
    <xs:element ref="urg:Households"/>
  </xs:sequence>
  <xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfHouseholds" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
<!-- ===== -->
<xs:element name="NumberOfHouseholds" type="urg:NumberOfHouseholdsType"/>
<xs:complexType name="NumberOfHouseholdsType">
  <xs:sequence>
    <xs:element name="class" type="gml:CodeType"/>
    <xs:element name="number" type="xs:integer"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="NumberOfHouseholdsPropertyType">
  <xs:sequence>
    <xs:element ref="urg:NumberOfHouseholds"/>
  </xs:sequence>
</xs:complexType>
<!-- ===== -->
<xs:complexType name="OfficesAndEmployeesType">
  <xs:complexContent>
    <xs:extension base="urg:StatisticalGridType">
      <xs:sequence>
        <xs:element name="numberOfOffices" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element name="numberOfEmployees" type="xs:nonNegativeInteger" minOccurs="0"/>
        <xs:element ref="urg:_GenericApplicationPropertyOfOfficesAndEmployees" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<!-- ===== -->
<xs:element name="OfficesAndEmployees" type="urg:OfficesAndEmployeesType"
substitutionGroup="urg:_StatisticalGrid"/>
<xs:complexType name="OfficesAndEmployeesPropertyType">
  <xs:sequence minOccurs="0">

```

```

<xs:element ref="urg:OfficesAndEmployees"/>
</xs:sequence>
<xs:attributeGroup ref="gml:AssociationAttributeGroup"/>
</xs:complexType>
<!-- ===== -->
<xs:element name="_GenericApplicationPropertyOfOfficesAndEmployees" type="xs:anyType" abstract="true">
  <xs:annotation>
    <xs:documentation>This element is reserved for future use.</xs:documentation>
  </xs:annotation>
</xs:element>
</xs:schema>

```

## A.2 Sample data (informative)

```

<?xml version="1.0" encoding="UTF-8"?>
<core:CityModel xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:grp="http://www.opengis.net/citygml/cityobjectgroup/2.0"
  xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:core="http://www.opengis.net/citygml/2.0"
  xmlns:urg="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urg/1.3"
  xmlns:uro="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3"
  xsi:schemaLocation="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/urg/1.3 http://www.kantei.g
o.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/schemas/urg/1.3/statisticalGrid.xsd
http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/uro/1.3 http://www.kantei.go.jp/jp/singi/tiiki/tos
hisaisei/itoshisaisei/iur/schemas/uro/1.3/urbanObject.xsd
http://www.opengis.net/citygml/cityobjectgroup/2.0 http://schemas.opengis.net/citygml/cityobjectgroup/2.0/cityO
bjectGroup.xsd
http://www.opengis.net/citygml/2.0 http://schemas.opengis.net/citygml/2.0/cityGMLBase.xsd
http://www.opengis.net/gml http://schemas.opengis.net/gml/3.1.1/base/gml.xsd">
  <gml:boundedBy>
    <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSSG/0/3857" srsDimension="3">
      <gml:lowerCorner>14532000 4006000 0</gml:lowerCorner>
      <gml:upperCorner>14533500 4007500 0</gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy> <core:cityObjectMember>
    <grp:CityObjectGroup>
      <gml:name>grid sample data</gml:name>
      <grp:usage codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/CityObjectG
roup_usage.xml">2000</grp:usage>
      <grp:groupMember>
        <urg:Population gml:id="population418">
          <gml:description>サンプル地区 1</gml:description>
          <gml:name>503064032</gml:name>
          <urg:urbanPlanType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/C
ommon_urbanPlanType.xml">1010</urg:urbanPlanType>
          <urg:areaClassificationType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelist
s/1.3/Common_areaClassification.xml">1030</urg:areaClassificationType>
          <urg:prefecture codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Com
mon_prefecture.xml">40</urg:prefecture>
          <urg:city codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_loc
alPublicAuthorities.xml">40220</urg:city>
          <urg:surveyYear>2017</urg:surveyYear>
          <urg:lod-1MultiSurfaceGeometry>
            <gml:MultiSurface gml:id="grid1">
              <gml:surfaceMember>
                <gml:Polygon>
                  <gml:exterior>
                    <gml:LinearRing>

```

```

    <gml:pos>14532759.523100004 4006444.6594000012 0</gml:pos>
    <gml:pos>14532759.523100004 4007003.0613999963 0</gml:pos>
    <gml:pos>14532063.776199996 4007003.0613999963 0</gml:pos>
    <gml:pos>14532063.776199996 4006444.6594000012 0</gml:pos>
    <gml:pos>14532759.523100004 4006444.6594000012 0</gml:pos>
  </gml:LinearRing>
</gml:exterior>
</gml:Polygon>
</gml:surfaceMember>
</gml:MultiSurface>
</urg:lod-1MultiSurfaceGeometry>
<urg:total>400</urg:total>
<urg:daytimePopulation>50</urg:daytimePopulation>
<urg:naturalIncrease>-1</urg:naturalIncrease>
<urg:births>3</urg:births>
<urg:deaths>4</urg:deaths>
<urg:socialIncrease>5</urg:socialIncrease>
<urg:moveFrom>10</urg:moveFrom>
<urg:moveTo>5</urg:moveTo>
<urg:increasement>4</urg:increasement>
<urg:malePopulation>200</urg:malePopulation>
<urg:femalePopulation>200</urg:femalePopulation>
<urg:populationByAgeAndSex>
  <urg:PopulationByAgeAndSex>
    <urg:age codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_age.xml">1010</urg:age>
    <urg:sex codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_sex.xml">1010</urg:sex>
    <urg:number>5</urg:number>
  </urg:PopulationByAgeAndSex>
</urg:populationByAgeAndSex>
<urg:populationByAgeAndSex>
  <urg:PopulationByAgeAndSex>
    <urg:age codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_age.xml">1020</urg:age>
    <urg:sex codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_sex.xml">1010</urg:sex>
    <urg:number>5</urg:number>
  </urg:PopulationByAgeAndSex>
</urg:populationByAgeAndSex>
<!-- omitted -->
</urg:Population>
</grp:groupMember>
<grp:groupMember>
  <urg:Population gml:id="population417">
    <gml:description>サンプル地区 1</gml:description>
    <gml:name>503064032</gml:name>
    <urg:urbanPlanType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_urbanPlanType.xml">1010</urg:urbanPlanType>
    <urg:areaClassificationType codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_areaClassification.xml">1030</urg:areaClassificationType>
    <urg:prefecture codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_prefecture.xml">40</urg:prefecture>
    <urg:city codeSpace="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_localPublicAuthorities.xml">40220</urg:city>
    <urg:surveyYear>2016</urg:surveyYear>
    <urg:lod-1MultiSurfaceGeometry xlink:href="#grid1">
      <!-- omitted -->
    </urg:lod-1MultiSurfaceGeometry>
  </urg:Population>

```

```
</grp:groupMember>  
<uro:fiscalYearOfPublication>2016</uro:fiscalYearOfPublication>  
</grp:CityObjectGroup>  
</core:cityObjectMember>  
</core:CityModel>
```

## Annex B (informative)

### Code lists for Statistical Grid Data

This annex exemplifies the specification of code lists for enumerative attributes of type *gml:CodeType* in Urban Planning ADE and provides proposals for selected attributes. Please note that this annex is non-normative and the presented code lists are neither mandatory nor complete.

#### Code lists for StatisticalGrid

|  |
|--|
| Code list of the subclasses of <i>StatisticalGrid</i> attribute <i>urbanPlanType</i> |
| See Code list for the <i>UrbanPlan</i> attribute <i>class</i> in part 2              |

|   |
|---|
| Code list of the subclasses of <i>StatisticalGrid</i> attribute <i>areaClassificationType</i> |
| See Code list for the <i>AreaClassification</i> attribute <i>class</i> in part 2              |

|   |
|---|
| Code list of the subclasses of <i>StatisticalGrid</i> attribute <i>prefecture</i> |
| See Code list for the <i>Administration</i> attribute <i>prefecture</i> in part 2 |

|   |
|---|
| Code list of the subclasses of <i>StatisticalGrid</i> attribute <i>city</i> |
| See Code list for the <i>Administration</i> attribute <i>city</i> in part 2 |

#### Code lists for Population

|   |       |      |       |
|---|-------|------|-------|
| Code list for <i>Population</i> attribute <i>populationByAgeAndSex</i> (attribute <i>age</i> of the datatype <i>PopulationByAgeAndSexType</i> )   |       |      |       |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_age.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_age.xml</a> |       |      |       |
| 1010  | 0-4   | 1120 | 55-59 |
| 1020  | 5-9   | 1130 | 60-64 |
| 1030  | 10-14 | 1140 | 65-69 |
| 1040  | 15-19 | 1150 | 70-74 |
| 1050  | 20-24 | 1160 | 75-79 |
| 1060  | 25-29 | 1170 | 80-84 |
| 1070  | 30-34 | 1180 | 85-89 |
| 1080  | 35-39 | 1190 | 90-94 |
| 1090  | 40-44 | 1200 | 95-99 |
| 1100  | 45-49 | 1210 | 100-  |
| 1110  | 50-54 |      |       |

|   |      |      |        |
|---|------|------|--------|
| Code list for <i>Population</i> attribute <i>populationByAgeAndSex</i> (attribute <i>sex</i> of the datatype <i>PopulationByAgeAndSexType</i> )   |      |      |        |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_sex.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/PopulationByAgeAndSexType_sex.xml</a> |      |      |        |
| 1010  | male | 1020 | female |

#### Code lists for LandPrice

|   |                 |      |          |
|---|-----------------|------|----------|
| Code list for <i>LandPrice</i> attribute <i>landPrice</i> (attribute <i>landuse</i> of the datatype <i>LandPricePerLandUseType</i> )  |                 |      |          |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandPricePerLandUseType_landuse.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/LandPricePerLandUseType_landuse.xml</a> |                 |      |          |
| 1010  | Residential ara | 3030 | Forestry |

|      |                          |      |  |
|------|--------------------------|------|--|
| 1011 | Housing prospective area | 6010 | Residential in urbanization control area |
| 5010 | Industry area            | 6020 | Forestry in urbanization control area    |
| 5011 | Semi-industrial area     |      |  |
| 5021 | Commercial area          |      |  |

|   |  |
|---|--|
| Code list for <i>LandPrice</i> attribute <i>landPrice</i> (attribute <i>currencyUnit</i> of the datatype <i>LandPricePerLandUseType</i> )   |  |
| <a href="http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_currencyUnit.xml">http://www.kantei.go.jp/jp/singi/tiiki/toshisaisei/itoshisaisei/iur/codelists/1.3/Common_currencyUnit.xml</a> |  |
| Currency codes defined by ISO 4217 that composed of a country's two-character Internet country code plus a third character denoting the currency unit.  |  |

## Bibliography

- [1] Filip Biljecki, Kavisha Kumar and Claus Nagel. CityGML Application Domain Extension (ADE): overview of developments, 27 August 2018, <https://opengeospatialdata.springeropen.com/articles/10.1186/s40965-018-0055-6> (Accessed 7 March 2019)
- [2] CityGML UtilityNetworkADE, [http://www.citygmlwiki.org/index.php?title=CityGML\\_UtilityNetworkADE](http://www.citygmlwiki.org/index.php?title=CityGML_UtilityNetworkADE) (Accessed 7 March 2019)
- [3] City Bureau, Ministry of Land, Infrastructure, Transport and Tourism of Japan: Implementation Guidelines of Basic Survey of City Planning (in Japanese), March 2019, <http://www.mlit.go.jp/common/001282174.pdf> (Accessed 18 April 2019)
- [4] Fukuoka Prefecture, Data Specification for Basic Survey of City Planning Database (survey by city), 2018 (in Japanese)
- [5] Fukuoka Prefecture, Data Specification for Basic Survey of City Planning Database (survey by prefecture), 2018 (in Japanese)

## Revision History

| Date       | Release | Author | Paragraph modified        | Description   |
|------------|---------|--------|---------------------------|---|
| 2019/3/20  | 0.9     |        | All                       | Document created  |
| 2019/5/7   | 1.0     |        | All                       | <p>Add elements and properties to ensure consistency with Basic Surveys Concerning City Planning (Part 1, Part 2, and Part 3)</p> <p>Add temporal attribute to accumulate and utilize time series datasets (Part1, part2, Part 3 and Part4)</p> <p>Import and extend grp::CityObjectGroup for object collection to mention the purpose or usage of the collection (Part1)</p> <p>Rename or add properties for clarification (Part 1)</p> <p>Add associations to describe global city model as LOD extension (Part 4)</p> <p>Modify UML diagrams and XML Schemata based on the modifications above (Part1, part2, Part 3 and Part4)</p> <p>Modify text description for clarification and Correct editorial errors (Through the document)</p> |
| 2019/11/01 | 1.1     |        | Part 1                    | Add an attribute “uro::widthType” to “tran::Road” and the code list for the attribute.  |
|            |         |        | Part 2                    | Change the associated classes of “urf::area”, “urf::boundary” and “urf::location” to the multiple geometric objects.  |
|            |         |        | Part 1, Part 2 and Part 4 | Correct inconsistency between UML diagrams and XMLSchema.   |
|            |         |        | Part 2 and Part 3         | <p>Add remarks to that of featureType classes. Change global element of feature attributes to local elements not to use the mechanism of “hook”.</p> <p>Delete “_GenericApplicationPropertyOf...” elements of dataType classes.</p>   |
|            |         |        | All                       | Correct editorial errors (Through the document)   |
| 2020/02/24 | 1.2     |        | Part 3 and Part 4         | Delete Part 4 to integrate the concept of extended LOD into statistical grid.   |
|            |         |        | All                       | Clarify the XMLSchema location  |

|            |     |  |              |  |
|------------|-----|--|--------------|--|
|            |     |  | All          | Update UML diagrams based on the OGC best practice (Modeling an application domain extension of CityGML in UML, 12-066. Open Geospatial Consortium. 2014.) |
|            |     |  | All          | Correct inconsistency with “Element - Property” structure in XMLSchema   |
|            |     |  | All          | The type “xs:double” used to describe area is changed to “gml:MeasureType” for its strictness with “uom”.  |
|            |     |  | Part 2       | The type “xs:double” used to describe length is changed to “gml:LengthType” for its strictness with “uom”.   |
|            |     |  | All Annex A  | XML Schemas are updated based on the modification above.   |
|            |     |  | All Annex B  | The URL of each codelist is added.   |
|            |     |  | All Annex A  | Sample datasets are updated based on the modification above.<br>Describe CRS identifier in the sample datasets.  |
| 2020/03/19 | 1.3 |  | Figures      | Fix printing mistakes in figures.  |
|            |     |  | Part1 and 2  | Add “PublicTransit” to represent public transit networks and delete extended properties for TransportationComplex in Urban Object module.                  |
|            |     |  | Part 2 and 3 | Correct typos.   |