Unión Internacional de Telecomunicaciones

UIT-T

FG-SSC

SECTOR DE
ESTANDARIZACION DE
TELECOMUNICACIONES
DE LA UIT

(10/2014)

UIT-T Grupo Temático sobre Ciudades inteligentes y sostenibles

Las ciudades inteligentes y sostenibles: Un análisis de las definiciones

Informe Técnico del Grupo Temático

PRÓLOGO

La Unión Internacional de Telecomunicaciones (UIT) es el organismo especializado de las Naciones Unidas en el campo de telecomunicaciones, tecnologías de la información y la comunicación (TIC). El Sector de Normalización de las Telecomunicaciones de la UIT (UIT-T) es un órgano permanente de la UIT. UIT-T se encarga de estudiar las preguntas técnicas, operativas y de tarifas y realizando Recomendaciones sobre los mismos, con miras a la normalización de las telecomunicaciones a nivel mundial.

Los procedimientos para el establecimiento de grupos temáticos se definen en la Recomendación UIT-T A.7. El Grupo de Estudio 5 de la UIT-T estableció el UIT-T Grupo Temático sobre Ciudades inteligentes y sostenibles (FG-SSS) en su reunión de febrero de 2013. El Grupo de Estudio 5 de la UIT-T es el grupo matriz de FG-SSC.

Los Entregables de grupos temáticos pueden tomar la forma de informes técnicos, especificaciones, etc., y su objetivo es proporcionar material para consideración del grupo matriz en sus actividades de normalización. Los Entregables de grupos temáticos no son Recomendaciones de la UIT-T.

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SERIE DE INFORMES TÉCNICOS FG-SSC

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Las ciudades inteligentes y sostenibles: Un análisis de las definiciones

Acerca de este Informe Técnico

Este Informe Técnico se ha preparado como una contribución al Grupo Temático en Ciudades inteligentes y sostenibles de la Unión Internacional de Telecomunicaciones (UIT) - Grupo de Trabajo 1.

Agradecimientos

Las ciudades inteligentes y sostenibles: Un análisis de las definiciones

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Las ciudades inteligentes y sostenibles: Un análisis de las definiciones

Resumen Ejecutivo

Este Informe Técnico fue escrito con el objetivo de establecer una definición concreta para las ciudades inteligentes y sostenibles que se pueden utilizar en todo el mundo. Aunque existe abundante literatura disponible sobre las ciudades inteligentes, no hay un conjunto estandarizado, comúnmente aceptado de terminologías que ayuden a describir acertadamente una "Ciudad Inteligente y Sostenible" (*Smart Sustainable City, SSC*). Tal definición estandarizada ayudará a crear una estructura más definida en relación con la infraestructura de la tecnología de la información y la comunicación (TIC), los indicadores clave de desempeño (*Key Performance Indicators, KPI*), métricas y políticas para ciudades inteligentes y sostenibles como son vistas por la UIT.

Se utilizaron los siguientes criterios comunes como guía, con base en sus características clave más importantes: (1) la sostenibilidad, (2) la calidad de vida, (3) los aspectos urbanos, y (4) la inteligencia. Como temas básicos para una SSC se incluyen: (1) la sociedad, (2) la economía, (3) el medio ambiente, y (4) el gobierno.

Aproximadamente 116 definiciones existentes de ciudades inteligentes y sostenibles se estudiaron y analizaron utilizando como guía las características y los temas de las SSCs desarrolladas en un Informe Técnico de la UIT-T paralelo sobre el Panorama de Ciudades inteligentes y sostenibles usado como guía. Estas definiciones fueron obtenidas de una variedad de fuentes, entre ellas: las comunidades académicas y de investigación, iniciativas gubernamentales, organizaciones internacionales (Naciones Unidas, la UIT, etc.), los perfiles de las empresas / corporaciones, definiciones centradas en el usuario, las asociaciones comerciales y las organizaciones desarrolladoras de estándares (*Standards Developing Organizations, SDO*).

Se establecieron categorías e indicadores clave y se identificaron también una lista de 30 términos clave a ser incluidos en una definición estandarizada. Las siguientes ocho (8) categorías fueron identificadas como clave para la SSC: (1) la calidad de vida y estilo de vida, (2) la infraestructura y los servicios, (3) las TIC, las comunicaciones, la inteligencia y la información, (4) personas, los ciudadanos y la sociedad, (5) el medio ambiente y la sostenibilidad, (6) el gobierno, la gestión y la administración, (7) economía y finanzas, y (8) la movilidad. Fueron identificados seis (6) indicadores primarios: vida inteligente, gente inteligente, Medio Ambiente inteligente y sostenibilidad, gobierno inteligente, la movilidad inteligente y economía inteligente. Las siguientes 30 palabras clave se identificaron para ser representantativas de una SSC.

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- •TIC
- • Adaptable
- • Fiable
- • Escalable
- • Accesible
- • Seguridad
- • Seguro
- • Resistente
- • Económico
- • Crecimiento
- • Nivel de vida
- • Empleo

- • Los ciudadanos
- • Bienestar
- • Médico
- • Prestaciones sociales
- • Seguridad física
- • Educación
- • Medio Ambiente
- • Infraestructura física y servicios
- • Transporte y movilidad
- • Agua

- • Servicios públicos y energía
- • Telecomunicaciones
- • Manufactura
- • Los desastres naturales y artificiales
- • Normativa y cumplimiento
- • Gobierno
- • Políticas y procedimientos
- • Normalización

Finalmente, con base en el análisis anterior, una propuesta de definición de una ciudad inteligente y sostenible fue aprobada por las UIT-T FG-SSC de la siguiente manera:

"Una ciudad inteligente y sostenible es una ciudad innovadora que utiliza las tecnologías de información y comunicación (TIC) y otros medios para mejorar la calidad de vida, la eficiencia de la operación y los servicios urbanos, y la competitividad, al tiempo que garantiza que cumple con las necesidades de las generaciones presentes y futuras con respecto a los aspectos económicos, sociales y ambientales".

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1. Introducción

En 2007, el número de personas que viven en ciudades superó el número de los que viven en zonas rurales. Se estima que la proporción de personas que viven en un entorno urbano superará el 70% en el 2050. De 1950 a 2010, las pequeñas ciudades han sido testigos de un aumento neto de 1,3 mil millones de personas, el doble del número de personas que habitan en las ciudades medianas (632 millones) o grandes ciudades (570 millones).

La gente se mueve a las zonas urbanas con la esperanza de encontrar mejores oportunidades de trabajo, así como un mejor nivel de vida. Sin embargo, el creciente número de personas que migran a las zonas urbanas conduce a problemas complejos como la congestión, el aumento de la demanda de un grupo limitado de los recursos naturales, así como otros recursos como la energía, el agua, el saneamiento, la educación y los servicios de salud[1], entre otros.

Las Tecnologías de la Información y la Comunicación (TIC) son capaces de proporcionar soluciones más amigables con el entorno y más económicamente viables para algunos de los problemas antes mencionados que se enfrentan en las ciudades. A partir de hoy, el papel de las TIC en la lucha contra los problemas ambientales no ha sido completamente identificado. Las áreas potenciales donde las TIC pueden ayudar incluyen la gestión de las fuentes de agua, la eficiencia energética y la gestión de residuos sólidos, infraestructura de transporte público reduciendo la congestión del tráfico, el crecimiento de la infraestructura de las TIC y la gestión de su impacto ambiental con referencia a las preocupaciones relacionadas con el campo electromagnético (*Electromagnetic Field, EMF*), aspectos visuales y monitoreo[2] de la calidad del aire.

La pregunta principal que la serie de informes técnicos sobre ciudades inteligentes y sostenibles pretende abordar es: A la luz de los crecientes problemas económicos y ambientales en las zonas urbanas (como resultado del aumento de la migración rural a urbana), ¿cómo pueden las TIC ser utilizadas para remediar la situación?

Este Informe Técnico analiza los principales aspectos de las ciudades inteligentes y las eco-ciudades desde: (i) la perspectiva de académicos, (ii) basado en iniciativas de negocios, y (iii) las colaboraciones de organizaciones internacionales, con el objetivo final de establecer una definición concreta para ciudades inteligentes y sostenibles que se pueden utilizar en todo el mundo. Esto también proporcionaría una base para la

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[1] http://www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx

[2] Organization for Economic Cooperation and Development (OECD): Addressing Environmental Challenges: The role of Information and Communication Technologies (ICTs) and the Internet. 2012

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comprensión de las características más comunes de las ciudades inteligentes y sostenibles.

1.1. Objeto y Campo de Aplicación

Un grupo temático de discusión sobre las Ciudades Inteligentes y Sostenibles[3] (FG-SSC) se estableció en febrero de 2013 por el Grupo Estudio 5 de la UIT-T (*Study Group 5, SG 5*) que ha estado trabajando en temas medioambientales y de cambio climático, incluyendo el desarrollo de una metodología para evaluar el impacto ambiental relacionado con las TIC en las ciudades.

Al FG-SSC se le ha asignado la tarea de analizar las soluciones y proyectos TIC que promuevan la sostenibilidad ambiental en las ciudades. Esto ayudaría a identificar las mejores prácticas utilizando las TIC en las ciudades que pueden ser estandarizadas por el UIT-T SG5. El FG-SSC ha celebrado una serie de reuniones abiertas con la participación de una variedad de partes interesadas, incluidos los miembros del UIT-T, las empresas de telecomunicaciones, empresas de TIC, los gobiernos, las instituciones académicas y otros. Estas reuniones abiertas proporcionan una fuente amplia de información obtenida de todos las partes interesadas. El FG-SSC aprovechará el papel del sector de las TIC para fomentar el crecimiento de las ciudades inteligentes y sostenibles en todo el mundo, mientras que el desarrollo de una hoja de ruta de normalización que garantice las actividades actualmente realizadas por diversas organizaciones de normalización (SDOs) y foros se han tomado en consideración.

El FG-SSC tiene cuatro (4) grupos de trabajo principales (*Working Group,* WG):

- WG1 - papel de las TIC y la hoja de ruta para las ciudades inteligentes y sostenibles.
- WG2 - infraestructura de TIC.
- WG3 - brechas de Normalización, los KPI y métricas.
- WG4 - Política y posicionamiento (comunicaciones, enlaces y miembros).

Uno de los entregables clave para WG1 en el Grupo Temático sobre SSC es desarrollar una definición estandarizada para las ciudades inteligentes y sostenibles: "¿Qué definiciones y características describen una Ciudad Inteligente y Sostenible", sobre todo en términos de infraestructura de las TIC. Con el fin de ayudar a abordar las preguntas anteriores, el FG-SSC ha desarrollado este informe técnico detallado sobre Ciudades Inteligentes y Sostenibles - Un análisis de las definiciones. Usando este Informe Técnico como base, el Grupo Temático será capaz de cumplir con su mandato de desarrollar una serie de proyectos de especificaciones técnicas de la UIT-T del Grupo de Estudio 5 para una definición estandarizada de una "Ciudad Inteligente y Sostenible".

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[3] http://www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx

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2. Metas y motivación para una definición completa

2.1. Metas

Con la rápida urbanización y la evidente necesidad de desarrollar un modelo sostenible para apoyar el crecimiento previsto, una serie de ciudades en el mundo se ha subido al vagón de 'Ciudad Inteligente y Sostenible' etiquetándose a sí mismas como 'inteligentes' de una manera u otra.

El objetivo principal de este Informe Técnico es ayudar a entender las múltiples definiciones de «Ciudades Inteligentes y Sostenibles, basadas en la literatura abierta, realizar análisis y luego proponer una definición formal y completa para el término de la UIT Ciudad inteligente y sostenible (que destaca específicamente la cuestión de la sostenibilidad en tales ciudades). Este conjunto estandarizado de terminologías para una "Ciudad inteligente y sostenible" será útil no sólo para la definición del término, sino también en relación con la infraestructura de TIC, los KPI, métricas y políticas para ciudades inteligentes y sostenibles como son vistas por la UIT.

2.2. Falta de terminologías normalizadas

Aunque existe abundante literatura disponible sobre las ciudades inteligentes, no hay un conjunto estandarizado, comúnmente aceptado de terminologías que ayuden a describir acertadamente un "Ciudad inteligente y sostenible". Dependiendo del lente con el cual se ve, hay diferentes descriptores, definiciones, características, indicadores e índices.

Para asegurarse de que la cuestión de la sostenibilidad en las ciudades inteligentes no se pasa por alto, el Grupo Temático de la UIT-T sobre Ciudades inteligentes y sostenibles ha conceptualizado un nuevo término. "Ciudades inteligentes y sostenibles que pueden considerarse una variante de las ciudades inteligentes (inclusive de algunas de las características básicas de las eco-ciudades / ciudades sostenibles).

Varias definiciones y características de las ciudades inteligentes y ciudades sostenibles tienen que ser analizados antes de establecer una definición estandarizada que se espera que proporcione una buena base para el desarrollo del concepto de ciudades inteligentes y sostenibles (SSC) para el Grupo Temático sobre SSC y sus diferentes grupos de interés.

Cuáles podrían ser las principales características que hacen a una ciudad "Ciudad inteligente y sostenible"? ¿Es el gobierno, la tecnología, la comunicación, el transporte, la infraestructura, la gente, la economía, el medio ambiente, los recursos naturales, la innovación, la calidad de vida o algo más? ¿Cuáles son los factores necesarios para que una ciudad sea llamada como inteligente y sostenible?

2.3. Necesidad de una definición completa

Como se explica en el apartado anterior, existe una clara necesidad de una definición estandarizada de Ciudad inteligente y sostenible". El proceso de elaboración de una

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nueva definición allanará claramente el camino para una estructura más definida no sólo por la definición del término, sino también en relación con la infraestructura de TIC, los KPI, métricas y políticas para ciudades inteligentes y sostenibles como son vistas por la UIT. Otro aspecto que también es fundamental es que dentro de la UIT-T, hay varios grupos de estudio involucradas con temas que se superponen o se cruzan con ciudades inteligentes y sostenibles. La Seguridad de los datos (SG17), así como otras organizaciones de normalización como la ISO, BSI, ANSI, IEC y IEEE, las cuales están trabajando en ciudades inteligentes y sostenibles también, aunque a través de un lente diferente y se basan en un marco diferente.

3. *Observaciones de la literatura*

Las siguientes observaciones preliminares se hacen de la literatura que describe las ciudades inteligentes y sostenibles. La definición de una ciudad inteligente y sostenible depende de la lente o el punto de vista adoptado (véase el Anexo 1 para la lista de definiciones y características analizadas). Esto es importante tener en cuenta, ya que este enfoque proporcionará una idea de porqué y qué ciertas características son importantes. Hay muchos puntos de vista subjetivos de lo que una ciudad inteligente y sostenible es y estos pueden ser segmentados en las siguientes categorías:

- Características
- Temas
- Infraestructura

Una combinación de astucia / inteligencia en un entorno urbano con la sostenibilidad como un telón de fondo clave es la base de este Informe Técnico. Tenga en cuenta que este informe técnico no es un documento de recomendaciones para las mejores prácticas, sino una descripción de lo que es predominante en la literatura abierta.

3.1. Características

Las siguientes características aparecen constantemente a través de la literatura en cuanto a la descripción de una ciudad inteligente y sostenible:

- **Sostenibilidad** - Esto está relacionado con la infraestructura de la ciudad y el gobierno, la energía y el cambio climático, la contaminación y los residuos, y sociales, la economía y la salud.
- **Calidad de vida** - Calidad de vida (*Quality of Life, QoL)* es un tema recurrente. Uno de los objetivos de una SSC sería la de mejorar la calidad de vida en términos de bienestar emocional, así como financiero.
- **Aspectos Urbanos** - Esto incluye múltiples aspectos e indicadores como: tecnología e infraestructura, sostenibilidad, gobierno y economía.
- **Inteligencia o astucia** – Una ciudad "inteligente" exhibe ambición implícita o explícitamente para mejorar los estándares económicos, sociales y ambientales. Los aspectos comúnmente citados de inteligencia incluyen economía inteligente, gente

inteligente, gobierno inteligente, movilidad inteligente, vida inteligente y entorno inteligente.

3.2. Los temas centrales

Hay cuatro temas básicos para una ciudad inteligente y sostenible:

- **Sociedad** - La ciudad es para sus habitantes (es decir, los ciudadanos).
- **Economía** - La ciudad debe ser capaz de prosperar - empleo, crecimiento económico y finanzas, etc.
- **Medio Ambiente** - La ciudad debe ser sostenible en su funcionamiento para el presente, así como las futuras generaciones.
- **Gobierno** - La ciudad debe ser robusta en su capacidad para la administración de las políticas y reunir los diferentes elementos.

3.3. Infraestructura - Física, de servicio y digital

La Infraestructura en un entorno urbano puede ser mejor descrita de una manera triple: física, de servicio y de las TIC o digital. La infraestructura física es lo que es verdaderamente "físico" - por ejemplo, edificios, vías de tren, carreteras, líneas eléctricas, tuberías de gas, de agua, fábricas y similares. Infraestructura de servicios es la superposición de servicios en los aspectos físicos - por ejemplo, un servicio de transporte, tales como Tránsito rápido de masas (*Mass Rapid Transit, MRT*, autobús), servicios públicos (agua, gas y electricidad), la educación y el cuidado de la salud. La infraestructura de las TIC es esencial para una ciudad inteligente y sostenible exitosa - que actúa como el "pegamento" que integra todos los otros elementos de la ciudad inteligente y sostenible actuando como una plataforma fundamental. La Infraestructura de las TIC es el núcleo y actúa como centro neurálgico, orquestando todas las diferentes interacciones entre los diferentes elementos esenciales y la infraestructura física.

4. Definiciones y análisis

4.1. Fuentes de información

En esta sección se presenta un estudio de las definiciones y características asociadas en términos de indicadores, índices y rankings de ciudades inteligentes y sostenibles. Para el propósito de este informe técnico, varios artículos fueron recolectados a través de Internet, así como de otras bases de datos. Estos artículos fueron revisados y analizados para ayudar a consolidar una amplia gama de perspectivas que aseguran que la definición de las ciudades inteligentes y sostenibles propuesta por los Grupos Temáticos incluye todos los aspectos principales. Estas definiciones se obtuvieron de una variedad de fuentes, tales como:

- La Academia y las comunidades de investigación.
- Las iniciativas gubernamentales, incluyendo la UE.
- Las organizaciones internacionales (Naciones Unidas, la UIT, etc.).
- Perfiles corporativo/empresa.
- Definiciones centradas en el usuario (de las principales firmas de investigación de mercado).
- Las asociaciones comerciales.
- Organizaciones de desarrollo de estándares.

Una lista completa de todas las definiciones que se encuentran en la literatura abierta se ha incluido en el Anexo 1.

4.2. Metodología

Dada la gran cantidad de datos, los distintos indicadores, métricas y las más de 100 definiciones para una ciudad inteligente, existía la necesidad de realizar un análisis en profundidad para determinar lo que sería una definición amplia e inclusiva de una ciudad inteligente y sostenible de la perspectiva de la labor realizada por el Grupo Temático sobre Ciudades Inteligentes y Sostenibles (FG-SSC). Se analizaron todas las definiciones del Anexo 1 para identificar lo que hace una ciudad inteligente y sostenible. Los resultados de este análisis que identifican las principales palabras clave y las características de una ciudad inteligente y sostenible se analizan con más detalle en la sección 5 de este informe.

Para cada definición, se extrajo y se tabuló un conjunto de palabras clave. Estas palabras clave se agruparon bajo algunos temas comunes. Algunas palabras como "inteligente" y "ciudad" están implícitas y fueron mencionadas en casi toda descripción, por lo que no están capturadas de forma explícita como una palabra clave independiente.

4.3. Enfoque

Un enfoque sistemático fue seguido durante todo el estudio, incluyendo:

- enfoque descendente - Indicadores, índices y clasificaciones (rankings).
- enfoque ascendente - Definiciones, características y descriptores.

Como parte de la investigación, varias palabras y combinaciones de las mismas se utilizaron durante la búsqueda de fuentes primarias. Palabras de búsqueda primaria incluyen (pero no limitados a): inteligente, sostenible, el medio ambiente, ciudad (es), definición, características, índice, indicador, características, TIC, inteligente, urbano, metodología, solución, ejemplo, éxito, y clasificación (ranking). Se realizó un análisis detallado de las diferentes palabras y características y perspectivas clave de estas diversas fuentes. Este enfoque ha proporcionado un conjunto verdaderamente diverso de las definiciones y ha suministrado un sentido de "integridad" o amplitud al estudio.

Sobre la base de las definiciones, se identificaron y documentaron una serie de palabras clave como se ilustra en el ejemplo siguiente:

Fuente	Definiciones	Palabras Clave
Giffinger, Rudolf, *et al.*. "Smart Cities Ranking of European Medium-sized Cities." Centre of Regional Science, Vienna UT, Oct. 2007. Page 10. Web. Last Accessed 8 Feb. 2014. http://www.smart-cities.eu/download/smart_cities_final_report.pdf	"Una ciudad con buen rendimiento de vista al futuro en [economía, población, gobernabilidad, movilidad, el medio ambiente y la vida] basadas en la combinación inteligente de dotaciones y actividades de ciudadanos que deciden por sí mismos, independientes y conscientes."	Economía, gente, gobierno, movilidad, medio ambiente, calidad de vida, ciudadanos conscientes con visión del futuro, ciudadanos que deciden por sí mismos, ciudadanos independientes.

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Fuente	Definiciones	Palabras Clave
Cohen, Boyd. "The Top 10 Smart Cities On The Planet." Fast Company, 11 Jan. 2011. Web. Last accessed 12 Feb. 2014. http://www.fastcoexist.com/1679127/the-top-10-smart-cities-on-the-planet	Las ciudades inteligentes y sostenibles utilizan tecnologías de la información y la comunicación (TIC) para ser más inteligentes y eficientes en el uso de los recursos, lo que resulta en un ahorro de costos y de la energía, una entrega de servicio y calidad de vida mejorados, y la reducción de la huella ambiental - todos apoyando la innovación y la economía baja en carbono.	TIC, la eficiencia de costos, la eficiencia energética, el ahorro de energía, calidad de vida, medio ambiente, mejor prestación de servicios, la innovación, economía baja en carbono
Hitachi. "Smart Sustainable City Overview." *Smart Cities: Hitachi*. Hitachi, Web. Last accessed 9 Feb. 2014. http://www.hitachi.com/products/smartcity/vision/concept/overview.html	La visión de Hitachi para la ciudad inteligente y sostenible busca lograr la preocupación por el medio ambiente mundial y la seguridad del estilo de vida y comodidad a través de la coordinación de la infraestructura. Ciudades Inteligentes y Sostenibles realizadas a través de la coordinación de las infraestructuras consisten en dos capas de infraestructura que apoyan estilos de vida de los consumidores junto con la infraestructura de gestión urbana que une a estos entre sí utilizando la tecnología de la información (TI).	Infraestructura coordinada, seguridad del estilo de vida, comodidad del estilo de vida, infraestructura urbana, TI.
Meijer, Albert, and Manuel Pedro Rodríguez Bolívar. "Governing the Smart Sustainable City: Scaling-Up the Search for Socio-Techno Synergy." T EGPA 2013 (Edinburgh, September) Permanent Study Group on E-Government, 2013, Web. Last accessed 8 Feb. 2014. https://www.scss.tcd.ie/disciplines/information_systems/egpa/docs/2013/BolivarMeijer.pdf	"Creemos que una ciudad es inteligente cuando las inversiones en capital humano y social y tradicional (transporte) y moderna infraestructura de comunicación (TIC) de combustible un crecimiento económico sostenible y una alta calidad de vida, con una gestión racional de los recursos naturales, a través de la gobernabilidad participativa. "	TIC, alta calidad de vida, manejo de recursos naturales, la gobernabilidad participativa, infraestructura de transporte, infraestructura de comunicación, el crecimiento económico, sostenibilidad.

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Fuente	Definiciones	Palabras Clave
IBM. "India Needs Sustainable Cities." IBM SMARTER PLANET, Web. Last accessed 6 Feb. 2014. http://www.ibm.com/smarterplanet/in/en/sustainable_cities/ideas/.	Sustitución de las infraestructuras reales de la ciudad es a menudo poco realista en términos de costo y tiempo. Sin embargo, con los recientes avances en la tecnología, podemos infundir nuestras infraestructuras existentes con nueva inteligencia. Por esto, nos referimos a la digitalización y la conexión de nuestros sistemas, para que puedan detectar, analizar e integrar los datos y responder de forma inteligente a las necesidades de sus jurisdicciones. En resumen, podemos revitalizarlos para que puedan ser más inteligentes y más eficientes. En el proceso, las ciudades pueden crecer y mantener la calidad de vida de sus habitantes.	Tecnología, sistemas de conexión, analizar datos, integrar datos, receptivo, eficiente, crecimiento, calidad de vida, sostenibilidad.

5. *Resultados*

5.1. Análisis de palabras clave de las definiciones

Se analizaron todas las definiciones (que figuran en el Anexo 1) para identificar las principales palabras clave y las características que hacen una ciudad inteligente y sostenible. Algunas palabras como "inteligente" y "ciudad" están implícitas y mencionadas en casi todo tipo de descripción, y por lo tanto estas palabras no han sido capturadas de forma explícita como una palabra clave independiente.

Un total de 50 palabras clave se identificaron que parecían tener múltiples referencias en todas las definiciones estudiadas. Hubo un total de 726 casos de estas 50 palabras clave. Estas son capturadas y presentadas a continuación en una tabla para reflejar la relación contribución / número de veces que estas palabras clave se repiten en todas las más de 100 definiciones. Basado en la revisión de la literatura, se desarrolló una representación gráfica de la importancia relativa de las diferentes palabras clave. Cuanto mayor sea la letra, más importante es la palabra.

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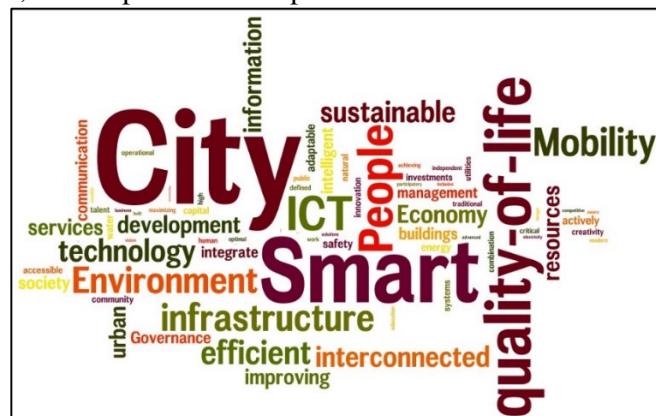
La Tabla 5-1 refleja un análisis cuantitativo de diferentes palabras clave y el número de ocurrencias que estas palabras clave tuvieron de los documentos estudiados (como se detalla en el Anexo 1).

Tabla 5.1 - Lista de palabras clave, ocurrencias y porcentaje relativo

		Palabra Clave	Ocurrencias totales	% Occurrencia
1		Calidad de Vida	44	6.1%
2		Desarrollo	16	2.2%
3		Servicios	10	1.4%
4		Construcciones	17	2.3%
5		Salud, Seguridad y Protección	26	3.6%
6		Servicios públicos	3	0.4%
7		Educación	16	2.2%
8		Energía	17	2.3%
9		Agua	16	2.2%
10		Electricidad	3	0.4%
11		Moderna	2	0.3%
12		TIC	27	3.7%
13		Tecnología	42	5.8%
14		Interconectada	1	0.1%
15		Información	24	3.3%
16		Communicación	15	2.1%
17		Inteligente	16	2.2%
18		Integrar	22	3.0%
19		Sistemas	34	4.7%
20		Avanzados	1	0.1%
21		Diseñar	4	0.6%
22		Comunidad	5	0.7%
23		Accessible	2	0.3%
24		Gente	36	5.0%
25		Urbano	16	2.2%
26		Sociedad	6	0.8%
27		Activamente	4	0.6%
28		Innovación	15	2.1%
29		Consciente	2	0.3%
30		Participativa	3	0.4%
31		Eficiente	24	3.3%
32		Sostenible	28	3.9%
33		Adaptable	3	0.4%
34		Optima	2	0.3%
35		Entorno	22	3.0%

	Palabra Clave	Ocurrencias totales	% Occurrencia
36	Recursos	27	3.7%
37	Natural	11	1.5%
38	Gobierno y Administración	35	4.8%
39	Administración	20	2.8%
40	Capital	4	0.6%
41	Operacional	1	0.1%
42	Público	6	0.8%
43	Soluciones	4	0.6%
44	Visión	1	0.1%
45	Economía	34	4.7%
46	Inversiones	9	1.2%
47	Negocios	13	1.8%
48	Competitiva	5	0.7%
49	Movilidad	14	1.9%
50	Transporte	18	2.5%
	Total	726	100%

5.2. Agrupación de palabras clave

Se hicieron algunas agrupaciones lógicas como se ilustra en la Tabla 5-2 y las diferentes palabras clave asignadas a estas agrupaciones con el fin de comprender mejor la importancia relativa de las diferentes palabras clave y categorías.

Table 5-2 – Agrupamientos Lógicos

Categoría	% Occurrencia
Calidad de Vida y Estilo de Vida	6%
Infraestructura y servicios	17%
TIC, comunicación, inteligencia, información	26%
Gente, ciudadanos, sociedad	12%
Medio Ambiente y sostenibilidad	17%
Gobierno, gestión y administración	10%
Economía y Finanzas	8%
Movilidad	4%
Total	**100%**

Con el fin de minimizar cualquier subjetividad en la definición de la agrupación palabra clave anterior, se realizó una búsqueda en la literatura para describir mejor cada uno de ellos. Esto es importante para mantener una línea de base de lo que se entiende por cada una de esas palabras clave.

TIC/Comunicación/Inteligencia/Información

Tecnología de información y comunicación (TIC) ofrece servicios como la seguridad, la salud, y el transporte para los ciudadanos, suministro de energía para industrias mejorado y rentable, el trabajo a distancia y comercio electrónico para las empresas, así como entretenimiento y comunicaciones para los individuos[4].

Infraestructura

La infraestructura incluye las estructuras físicas y organizativas básicas necesarias para las operaciones de la sociedad / empresas y los servicios / instalaciones que mantienen la economía funcional. [5, 6]

Medio Ambiente / Sostenibilidad

Según la definición de la UICN, el PNUMA y WWF: "La sostenibilidad está mejorando la calidad de vida humana sin rebasar la capacidad de carga de soportar los ecosistemas"[7]. La Comisión Mundial sobre el Medio Ambiente y Desarrollo[8] (también conocida como la Comisión Brundtland) define el desarrollo sostenible como una forma de desarrollo que "satisface las necesidades del presente sin comprometer la capacidad de las generaciones futuras para satisfacer sus propias necesidades".[9]

Gente / Ciudadanos/ Sociedad

El elemento diferenciador entre una ciudad digital y una ciudad inteligente es gente inteligente. Los elementos clave incluyen habilidades, niveles de educación, el aprendizaje permanente y la integración social en términos de capital humano. [10]

Calidad de vida / Estilos de Vida

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[4] TIC detrás de las ciudades del futuro. Nokia. Consultado el 29 de junio 2014 de http://nsn.com/news-events/publications/unite-magazine-february-2010/the-ict-behind-cities-of-the-future

[5] Diccionarios Oxford. Obtenido el 1 de junio de 2014 de http://www.askoxford.com/concise_oed/infrastructure

[6] Sullivan, Arthur, Steven M. Sheffrin (2003), Economía: Principios en acción. Upper Saddle River, Nueva Jersey 07458: Pearson Prentice Hall. p. 474.

[7] UICN / PNUMA / WWF. Cuidar la Tierra: Una Estrategia para una Vida Sostenible. (Gland, Suiza: 1991). (UICN - Unión Internacional para la Conservación de la Naturaleza, el PNUMA - Programa de las Naciones Unidas para el Medio Ambiente, WWF - Fondo Mundial para la Naturaleza).

[8] Documentos de la ONU Recopilación de un conjunto de acuerdos globales. Comité de ONG sobre la Educación. Consultado el 02 de junio de < http://www.un-documents.net/wced-ocf.htm >

[9] Guía para la Sostenibilidad Ambiental para el Sector TIC. Unión Internacional de Telecomunicaciones. Obtenido de http://www.itu.int/dms_pub/itu-t/oth/4B/01/T4B010000060001PDFE.pdf. 2012

[10] Estudio de Ciudades Inteligentes: Estudio Internacional sobre la Situación de las TIC, Innovación y Conocimiento en las ciudades. Iñaki Azkuna, Alcalde de la ciudad de Bilbao. Obtenido de http://www.cities-localgovernments.org/committees/cdc/Upload/formations/smartcitiesstudy_en.pdf

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La Organización Mundial de la Salud (OMS) define la calidad de vida como "la percepción del individuo de su posición en la vida en el contexto de los sistemas de cultura y de valor". Estos incluyen su ubicación en relación con los objetivos, expectativas y preocupaciones. [11]

Gobierno / Gestión / Administración[12]

La gobernabilidad inteligente incluye la participación política y activa, servicios de ciudadanía y el uso inteligente del gobierno electrónico.

Economía / Recursos

Elementos de éxito de la economía de empresa y de la economía de innovación / ideas se combinan para formar la economía inteligente. También prevé un entorno de alta calidad que se centra en la mejora de la seguridad energética y la cohesión social. [13]

Movilidad

La Movilidad inteligente mueve a las personas y mercancías, mientras que mejora los recursos económicos, ambientales y humanos, haciendo hincapié en los viajes multimodales convenientes y accesibles (garantizando la seguridad y el funcionamiento a velocidades adecuadas). [14]

5.3. Términos importantes que deben incluirse en una definición estandarizada

Sobre la base de todos los análisis realizados anteriormente, utilizando las categorías clave y principales indicadores de palabras clave, los siguientes son los 30 términos clave que deberían incluirse en una definición estandarizada para una ciudad inteligente y sostenible.

• TIC	• Nivel de vida	• Agua
• Adaptable	• Empleo	• Servicios públicos y energía
• Fiable	• Ciudadanos	• Telecomunicaciones
• Escalable	• Bienestar	
• Accesible	• Médico	• Manufactura
• Seguridad	• Prestaciones sociales	• Los desastres

[11] Programa de Salud Mental: Calidad de Vida de medición. División de Salud Mental y Prevención del Abuso de Sustancias. Organización Mundial de la Salud. 1997. Obtenido de http://www.who.int/mental_health/media/68.pdf.

[12] http://www.cities-localgovernments.org/committees/cdc/index.asp?IdPage=62

[13] Construyendo La Economía Inteligente de Irlanda - http://www.taoiseach.gov.ie/eng/Building_Ireland's_Smart_Economy/Building_Ireland's_Smart_Economy_-_Executive_Summary.pdf

[14] Movilidad Ciudad Inteligente: una llamada a la acción para la nueva década. Agencia de Protección Ambiental de los Estados Unidos. Febrero de 2010. Obtenido de http://www.dot.ca.gov/hq/tpp/offices/ocp/smf_files/SMF_handbook_062210.pdf.

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		naturales y artificiales
• Seguro • Resistente • Económico • Crecimiento	• Seguridad física • Educación • Ambiental • La infraestructura física y de servicios • Transporte y movilidad	• Normativa y cumplimiento • Gobierno • Políticas y procedimientos • Normalización

6. Definición Recomendada

6.1. Criterios para definición

Sobre la base de un análisis detallado de las palabras clave en más de 100 definiciones de una ciudad inteligente y sostenible, se encontró que los siguientes criterios mejor definen una ciudad inteligente y sostenible:

Categorías o grupos clave

- TIC/Comunicación/Inteligencia/Información
- Infraestructura y servicios
- Medio Ambiente / sostenible
- Personas/ciudadanos/Sociedad
- Calidad de vida/Estilos de Vida
- Gobierno/Gestión/Administración
- Economía/Recursos
- Movilidad

Categorías basadas en indicadores clave

- Vivienda Inteligente
- Personas inteligentes
- Entorno inteligente y sostenibilidad
- Gobierno inteligente
- Movilidad inteligente
- Economía inteligente

Los términos clave a ser incluidos

Un conjunto de 30 términos clave fueron identificados como esenciales para ser incluidos en la definición estandarizada para una Ciudad inteligente y sostenible. Esta lista se proporciona en la sección 5.3.

6.2. Especificación

Basados en el análisis descrito en este informe técnico, el siguiente puede servir de base para una especificación para una "ciudad inteligente y sostenible".

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Una ciudad inteligente y sostenible es una ciudad que aprovecha la infraestructura de las TIC de manera adaptable, confiable, escalable, accesible, segura, cautelosa y adaptable con el fin de:

- Mejorar la calidad de vida de sus ciudadanos.
- Garantizar el crecimiento económico tangible, como un mejor nivel de vida y oportunidades de empleo para sus ciudadanos.
- Mejorar el bienestar de sus ciudadanos incluyendo la atención médica, el bienestar, la seguridad física y la educación.
- Establecer un enfoque ambientalmente responsable y sostenible que "satisfaga las necesidades del presente sin sacrificar las necesidades de las generaciones futuras".
- Modernizar los servicios basados en infraestructuras físicas, tales como el transporte (movilidad), el agua, los servicios públicos (energía), las telecomunicaciones y los sectores manufactureros.
- Reforzar la funcionalidad de la prevención y el manejo de los desastres naturales y de origen humano, incluyendo la capacidad para hacer frente a los impactos del cambio climático.
- Proporcionar una normativa eficaz y bien balanceada, mecanismos de cumplimiento y gobernabilidad con políticas y procesos adecuados y equitativos de una manera estandarizada.

6.3. Definición acordada por FG-SSC

En las reuniones celebradas por FG-SSC desde el 5-6 marzo 2014 en Ginebra, las siguientes definiciones se acordaron abarcando las principales características de ciudades inteligentes y sostenibles:

> *"Una ciudad inteligente y sostenible (SSC) es una ciudad innovadora que utiliza las tecnologías de información y comunicación (TIC) y otros medios para mejorar la calidad de vida, la eficiencia de la operación y los servicios urbanos, y la competitividad, garantizando al mismo tiempo la satisfacción de las necesidades de generaciones presentes y futuras con respecto a los aspectos económicos, sociales y ambientales ".*

7. Conclusiones

Este Informe Técnico proporciona una percepción de lo que se entiende por una "ciudad inteligente y sostenible (SSC)" y los factores subyacentes que hacen que una ciudad inteligente.

- Este Informe Técnico analizó aproximadamente 120 definiciones existentes de ciudades inteligentes y sostenibles a partir de diversas fuentes para determinar un tema común identificando una ciudad inteligente y sostenible.
- Además, este Informe Técnico examinó los indicadores clave y categorías que deben tenerse en cuenta para una ciudad inteligente y sostenible.

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- Una lista de 30 términos clave a ser incluidos en una definición estandarizada también fueron identificados.
- Aunque este Informe Técnico se basa en fuentes secundarias de datos, puede ser de gran utilidad para comprender el concepto de ciudad inteligente y sostenible.
- Del mismo modo, este informe técnico puede ser la base del desarrollo de una definición estándar de una ciudad inteligente y sostenible mundial y posteriormente puede ser utilizado para desarrollar un marco para medir el desempeño de una ciudad inteligente y sostenible.
- Por último, una definición propuesta completa de una ciudad inteligente y sostenible ha sido presentada.

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Anexo 1 - Definiciones de una ciudad inteligente y sostenible

*Detalles de las referencias se proveen en el Anexo 2.

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
1	Academic	A smart sustainable city is a city well performing in six (6) characteristics, built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens. 1) Economy, 2) Mobility, 3) Environment, 4) People, 5) Living, 6) Governance.	Economic growth, transport, mobility, environment, standard of living, governance.	Giffinger *et al.* (2007)
2	Academic	"We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance."	ICT, high quality of life, natural resource management, participatory governance, transport infrastructure, communication infrastructure, economic growth, sustainability.	Meijer *et al.* (2013)
3	Academic	The rudiments of what constitutes a smart sustainable city which we define as a city in which ICT is merged with traditional infrastructures, coordinated and integrated using new digital technologies.	Traditional infrastructure, ICT, integrated infrastructure, coordinated infrastructure, digital technology.	Batty *et al.* (2012)
4	Academic	Instead of striving for physical growth, a city's success today should be measured by how wisely it uses energy, water, and other resources, how well it maintains a high quality of life for its people, and how smart it is in building prosperity on a sustainable foundation. In short, cities have to become much smarter about how they use the existing capacities and resources.	Wise use of resources, quality of life, sustainability.	Dixon (2012)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
5	Academic	The Cellular City Compact, diverse, walk able and attractive cities are a luxury, but they should not be. The City Science Initiative at the MIT Media Lab is exploring technologies to help develop cities that facilitate the creation of desirable urban features, such as shared electric vehicles, adaptable living environments, and flexible work spaces. Our goal is to design urban cells that are compact enough to be walk able and foster casual interactions, without sacrificing connectivity to their larger urban surroundings. These cells must be sufficiently autonomous and provide resiliency, consistent functionality, and elegant urban design. Most importantly, the cellular city must be highly adaptable so it can respond dynamically to changes in the structure of its economic and social activities.	Urban, technology, desirable features, shared electric vehicles, adaptable living environments, flexible work places, compact urban cells, elegant design, connected, autonomous adaptable dynamic.	Massachusetts Institute of Technology (2014)
6	Academic	Tracing the genealogy of the word smart in the label Smart Sustainable City can contribute to an understanding of how the term smart is being loaded. In marketing language, smartness is cantered on a user perspective. Because of the need for appeal to a broader base of community members, smart serves better than the more elitist term intelligent. Smart is more user-friendly than intelligent, which is limited to having a quick mind and being responsive to feedback. Smart Sustainable City is required to adapt itself to the user needs and to provide customized interfaces.	User perspective, user friendly, responsive, adaptability.	Nam *et al.* (2011)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
7	Government	"A city that monitors and integrates conditions of all of its critical infrastructures including roads, bridges, tunnels, rails, subways, airports, sea-ports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens."	Integrated infrastructure, resource optimization, preventive maintenance, monitors security, and maximizes services.	Hall *et al*. (2009)
8	Academic	The term "smart city" is not used in a holistic way but with reference to various aspects which range from ICT districts to smart inhabitants in terms of their educational level. In addition, the term often refers to the relation between city government and citizens (e.g. good governance or smart governance). There is often a strong reference to the use of modern technology in everyday urban life, which includes innovative transport systems, infrastructures and logistics as well as green and efficient energy systems. Additional 'soft factors' connected to urban life for a Smart City include: participation, security/safety, cultural heritage. In conclusion, the literature review reveals the following main dimensions (or clusters of aspects): smart governance (related to participation); smart human capital (related to people); smart environment (related to natural resources); smart living (related to the quality of life) and smart economy (related to competitiveness).	Living, governance, economy, infrastructure, ICT, citizens, transport, energy, urban life.	Lombardi (2011)
9	Academic	The 'eco-cities' theme does not stand alone but is situated in a complex array of relevant variations of sustainable development, sustainable urban development, sustainable communities, bioregionalism, community economic development, appropriate technology, social ecology, green movement.	Ecology, technology, communities.	Roseland (1997)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
10	Academic	A sustainable city is one in which its people and businesses continuously endeavour to improve their natural, built and cultural environments at neighbourhood and regional levels, whilst working in ways which always support the goal of global sustainable development.	Business, natural environment, built environment, cultural environment.	Haughton *et al.* (1994)
11	Academic	We say that a sustainable city is one in which the community has agreed on a set of sustainability principles and has further agreed to pursue their attainment. These principles should provide the citizenry with a good quality of life, in a liveable city, with affordable education, health care, housing, and transportation.	Quality of life, lovable city, education, health care, housing	Munier (2007)
12	Academic	A sustainable city can broadly be defined as "one that has put in place action plans and policies that aim to ensure adequate resource availability and (re)utilization, social comfort and equity and economic development, and prosperity for future generations".	Policies, resource availability, social comfort, economic development, future generations.	Jingzhu (2011a)
13	Academic	A sustainable city is one that relates its use of resources and its generation and disposal of wastes to the limits imposed on such activities by the planet and its organisms.	Resources, waste, planet and organisms.	Jingzhu (2011b)
14	Academic	The basic feature of a sustainable city can be characterized as: facilitating economical uses of resources by technological and environmental improvements, targeting economic development, wealth building, social progress, and ecological security, maintaining a balance among resources, environment, information, interflow of material of the inner-outer urban system, meeting a city's future needs based on a correct assessment, and satisfying the present needs of urban development.	Technology, economic development, wealth, social progress, resources, information, urban development.	Jingzhu (2011c)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
15	Academic	"Improving the quality of life in a city, including ecological, cultural, political, institutional, social, and economic components without leaving a burden on future generations".	Ecological, cultural, political, institutional, social and economic.	Jingzhu (2011d)
16	Academic	World Watch Institute considered that a city moving toward sustainability should improve public health and well-being, lower its environmental impacts, increase recycling its materials, and use energy with growing efficiency.	Public health, materials, recycle, energy efficiency.	Jingzhu (2011e)
17	Academic	A sustainable city is one that can provide and ensure sustainable welfare for its residents with the capacity of maintaining and improving its ecosystem services.	Residents, ecosystem services, welfare.	Jingzhu (2011f)
18	Academic	The urban ecosystem service can be generally defined as processes and conditions offered for people's survival and development by cities as social-economic-natural complex ecosystems.	People, survival, development, social, economic, natural.	Jingzhu (2011g)
19	Academic	A smart city is referred to as the safe, secure, environmentally green, and efficient urban centre of the future with advanced infrastructures such as sensors, electronics, and networks to stimulate sustainable economic growth and a high quality of life.	Safe, secure, environment, green, efficient, urban, future, infrastructure, sensor, electronics, networks, sustainability, economy, quality of life.	Schaffers *et al.* (2012a)
20	Academic	Major aspects highlighted in this paper balance different economic and social demands as well as the needs implied in urban development, while also encompassing peripheral and less developed cities.	Economic, social, urban development.	Schaffers *et al.* (2012b)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
21	Academic	A smart city as a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create a sustainable greener city, a competitive and innovative commerce and an increase in the quality of life with a straightforward administration and maintenance system of the city.	Advanced, high-tech, information, sustainability, green, competitive, innovation, commerce, quality of life, administration, maintenance.	Schaffers *et al.* (2012c)
22	Academic	A "smart city" is a city well performing in a forward-looking way in the six characteristics (smart economy, smart people, smart governance, smart mobility, smart environment, smart living) built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens.	Citizens, economy, people, governance, mobility, environment, living.	Chourabi *et al.* (2012a)
23	Academic	A city "connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city".	Interconnected IT, social, business infrastructure.	Chourabi *et al.* (2012b)
24	Academic	A city striving to make itself "smarter" (more efficient, sustainable, equitable, and liveable)	Efficient, sustainable, equitable, liveable, standard of living.	Chourabi *et al.* (2012c)
25	Academic	Based on the exploration of a wide and extensive array of literature from various disciplinary areas, we identify eight critical factors of smart city initiatives: management and organization, technology, governance, policy context, people and communities, economy, built infrastructure, and natural environment.	Technology, governance, policy context, people and communities, economy, built infrastructure, and natural environment.	Chourabi *et al.* (2012d)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
26	Academic	In general terms, we can define a "smart city" as a public administrative service or authority that delivers (or aims to deliver) a set of new generation services and infrastructure, based on information and communication technologies. Defining a new generation service is nevertheless a bit more complex and broader as the systems and services provided by smart cities should be easy to use, efficient, responsive, open and sustainable for the environment. The "smart city" concept brings together all the characteristics associated with organizational change, technological, economic and social development of a modern city. Moreover, smart city services and infrastructures entail the characteristics of engaging and interacting with the citizen that makes use of them. Another central element is the adaptive nature of services, ICT systems, infrastructures, buildings that comprehend the smart city concept. They acknowledge their initial status via a set of indicators and adapt their response according to the external changes that affect them. In doing so, they intelligently adapt to the external variables and demands that they are subject to, thus offering an always customized, more efficient and adaptive response.	Technology, economic, social development, ICT, infrastructure, buildings.	González *et al.* (2011)
27	Corporate	Hitachi's vision for the "smart sustainable city" seeks to achieve concern for the global environment and lifestyle safety and convenience through the coordination of infrastructure. Smart sustainable cities realized through the coordination of infrastructures consist of two infrastructure layers that support consumers' lifestyles together with the urban management infrastructure that links these together using IT.	Coordinated infrastructure, lifestyle safety, lifestyle convenience, urban infrastructure, IT.	Hitachi (2014)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
28	Corporate	A smarter city uses technology to transform its core systems and optimize finite resources. At the highest levels of maturity, a smarter city is a knowledge-based system that provides real-time insights to stakeholders, as well as enabling decision-makers to proactively manage the city's subsystems. Effective information management is at the heart of this capability, and integration and analytics are the key enablers.	Technology, transform, optimize finite resources, real-time information, decision-making information, information management, integration, analytics.	IBM (2013)
29	Corporate	Five (5) steps to make a city smart: 1. Vision: setting the goal and the roadmap to get there; 2. Solutions: bringing in the technology to improve the efficiency of the urban systems; 3. Integration: combining information and operations for overall city efficiency; 4. Innovation: building each city's specific business model; 5. Collaboration: driving collaboration between global players and local stakeholders.	Urban systems, efficiency, technology, integration, innovation, efficiency.	Schneider Electric (2014)
30	Corporate	A "smart sustainable city" is one in which the seams and structures of the various urban systems are made clear, simple, responsive and even malleable via contemporary technology and design. Citizens are not only engaged and informed in the relationship between their activities, their neighbourhoods, and the wider urban ecosystems, but are actively encouraged to see the city itself as something they can collectively tune in, such that it is efficient, interactive, engaging, adaptive and flexible, as opposed to the inflexible, mono-functional and monolithic structures of many 20th century cities.	Urban system optimization, technology and design, informed citizens, citizen contribution, efficiency, interactive, adaptive, flexible.	ARUP (2011)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
31	Corporate	Infrastructure, operations and people. What makes a city? The answer, of course, is all three. A city is an interconnected system of systems. A dynamic work in progress, with progress as its watchword. A tripod that relies on strong support for and among each of its pillars, to become a smarter city for all.	Interconnected systems, progress, infrastructure, operations, and people.	IBM (2014)
32	Corporate	A city's attractiveness is directly related to its ability to offer the basic services that support growth opportunities, build economic value and create competitive differentiation. Potential inhabitants, of both the commercial and residential variety, are a discriminating lot, and they are looking for cities that operate efficiently and purposefully. They are looking for smarter cities. In particular, we are seeing the most advanced cities focus on three areas of expertise: • Leveraging information to make better decisions. • Anticipating and resolving problems proactively. • Coordinating resources to operate more efficiently. Forward-thinking cities are not waiting for better economic times to take action. They are focused on staying competitive, maximizing the resources at their disposal and laying the groundwork for transformation. They are redefining what it means to be a smarter city.	Growth, economy, competitive differentiation, efficiency, purpose.	IBM (2012)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
33	Corporate	Replacing the actual city infrastructures is often unrealistic in terms of cost and time. However, with recent advances in technology, we can infuse our existing infrastructures with new intelligence. By this, we mean digitizing and connecting our systems, so they can sense, analyse and integrate data, and respond intelligently to the needs of their jurisdictions. In short, we can revitalize them so they can become smarter and more efficient. In the process, cities can grow and sustain quality of life for their inhabitants.	Technology, connecting systems, analyse data, integrate data, responsive, efficient, growth, quality of life, sustainability.	IBM-India Needs Smart Cities (2014)
34	Corporate	The "smart sustainable city" concept is really a framework for a specific vision of modern urban development. It recognizes the growing importance of information and communication technologies (ICTs) as drivers of economic competitiveness, environmental sustainability, and general liveability. By leveraging ICT as a core element of their development, the smart sustainable cities of the future will foster economic growth, improve the lifestyle of citizens, create opportunities for urban development and renewal, support eco-sustainability initiatives, improve the political and representative process, and provide access to advanced financial services. The right ICT infrastructure will affect the way each city will be created and evolved. It will enable smart sustainable cities to include vastly enhanced sustainable areas, such as smart buildings, smart infrastructures (water, energy, heat, and transportation) and smart services (e-substitutes and e-services for travel, health, education, and entertainment), which drastically change the urban experience for city dwellers and travellers.	ICT, economy, environment, sustainability, quality of life, development, renewal, citizen representation, financial services, smart buildings, smart infrastructure, water, energy, heat, transportation, e-services.	Alcatel Lucent (2011)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
35	Corporate	The most effective definition of a smart sustainable city is a community that is efficient, liveable, and sustainable, and these three elements go hand-in-hand. Traditionally, water, gas, electricity, transportation, emergency response, buildings, hospitals, and public services systems of a city are separate and operate in silos independent of each other. A truly efficient city requires not only that the performance of each system is optimized but also that these systems are managed in an integrated way to better prioritize investment and maximize value. An efficient city also starts a community on the path to become competitive for talent, investment, and jobs by becoming more liveable. A city must work to become a pleasant place to live, work, and play. It must appeal to residents, commuters, and visitors alike. It must be socially inclusive, creating opportunities for all of its residents. It must provide innovative, meaningful services to its constituents. Liveability plays a critical role in building the talent pool, the housing market, and in providing cultural events which can bring memorable experiences, international attention, and investment to the community. A sustainable community is one which reduces the environmental consequences of urban life and is often an output of efforts to make the city more efficient and liveable. Cities are the largest contributors of carbon emissions; the highways, public spaces, and buildings we rely on to live, work, and play emit the bulk of each city's emissions. Implementing efficient, cleaner, and sustainable operations in all of these areas is critical to minimizing a city's environmental footprint.	Efficient, quality of life, sustainability, integrated, services, natural resources, resource optimization, talent, investment, jobs, socially inclusive, innovative, low carbon, efficiency, regeneration.	Aoun-Schneider Electric (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
		Cities must also look at other methods of achieving sustainability, including resource efficiency, regenerating aging districts, ensuring robustness of systems, and incorporating design and planning in harmony with their natural ecosystem, as opposed to simply living in them.		
36	Corporate	A smart sustainable city is typically defined as "an environmentally conscious city that uses information technology (IT) to utilize energy and other resources efficiently." In Hitachi's vision, a smart sustainable city is one that seeks to satisfy the desires and values of its residents, with the use of advanced IT to improve energy efficiency and concern for the global environment as prerequisites, and in so doing maintains a "well-balanced relationship between people and the Earth."	Environment, ICT, energy, resource management, efficiency, environment, values of citizens, desires of citizens.	Smart Cities: Hitachi (2014)
37	Corporate	A city has common capabilities and delivers a set of common services, as well – office and residential buildings, natural resource management, transportation, health and safety, waste management, education and culture, public administration and services. One important characteristic that distinguishes an intelligent city is the manner in which it delivers services using advanced technologies: an integration of a number of innovations including machine-to-machine communication enabled by telematics, sensors and RFID technologies, smart grid technologies to enable better energy production and delivery, intelligent software and services, and high-speed communications technologies that serve as a core network for all related city, citizen and business services.	Services, natural resource management, transportation, health, safety, waste management, education, culture, public administration, services, ICT, RFID, integrated, smart grid, energy, high speed communication.	Berton *et al.*Accenture (2014)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
38	Corporate	The 'Smart Community' is a next-generation community in which the management and optimized control of various infrastructures such as electricity, water, transportation, logistics, medicine, and information are integrated. The 'Smart Community' will provide comprehensive solutions encompassing energy, water, and medical systems in order to realize a synergetic balance between environmental considerations and comfortable living.	Electricity, water, transportation, logistics, medicine, information, integrated, optimization, energy, comfortable living.	Takenaka- Toshiba (2012)
39	Corporate	We define a "smart sustainable city" as the city that uses information technology and communications to make both its critical infrastructure, its components and utilities offered more interactively, efficiently and where citizens are made more aware of them. It is a city committed to the environment, both environmentally and in terms of cultural and historical elements	ICT, infrastructure, utilities, interactive, efficient, aware, environment, culture, history	Telefónica (2014)
40	Corporate	A city that uses data, information and communication technologies strategically to: • provide more efficient, new or enhanced services to citizens, • monitor and track government's progress toward policy outcomes, including meeting climate change mitigation and adaptation goals, • manage and optimize the existing infrastructure, and plan for a new one more effectively, • reduce organizational silos and employ new levels of cross-sector collaboration, enable innovative business models for public and private sector service provision.	Quality of life, authority, development, citizens, infrastructure.	Arup, Accenture, Horizon, University of Nottingham (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
41	Corporate	The "smart city" concept includes digital city and wireless city. In a nutshell, a smart city describes the integrated management of information that creates value by applying advanced technologies to search, access, transfer, and process information. A smart city encompasses e-home, e-office, e-government, e-health, e-education and e-traffic.	ICTs, quality of life, health, employment.	Huawei (2014)
42	Corporate	A sustainable city is made up of three (3) main parameters to make sure that there is an overall development of energy, health care, buildings, transport, and water management in a city: • Environmental care – With right technologies, cities will become more environmentally friendly. • Competitiveness – With the right technologies, cities will help their local authorities and businesses to cut costs. • Quality of life – With the right technologies, cities will increase the quality of life for their residents.	Quality of life, technologies, authorities, buildings, transport, water.	Siemens (2014)
43	Corporate	As nations look to rebuild their aging infrastructures and at the same time take on the challenge of global climate change, Patel argues that resource usage needs to be at the heart of their thinking. We must also take a fundamental perspective in examining "available energy" in building and operating the infrastructure. Only if we use fewer resources to both build and run our infrastructures, he says, we will create cities that can thrive for generations to come. We can only build in that way, he suggests, if we seamlessly integrate IT into the physical infrastructure to provision the resources – power, water, waste, etc. – at a city scale based on the need.	Infrastructure, energy, IT, power, water, waste.	Patel,-Hewlett Packard (2014)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
44	Corporate	One manifestation of the Oracle iGovernment vision is Oracle's Solutions for Smart Cities, which will address the ever increasing need to provide businesses and citizens with transparent, efficient and intelligent engagement with their local authority/administration – through any channel – for any purpose, from information requests and government programme enrolment, to incident reporting or scheduling inspections, to complete online start-up of a local business. Development, implementation and refinement of such a multichannel, single point-of-contact platform to all government organizations lays the foundation for a range of additional capabilities from business recruitment and retention to self-selecting, interest- and knowledge-based communities amongst citizens to improved management of civil contingencies and emergency disaster planning.	Authority, information, business, development, citizens, disaster.	Oracle (2014)
45	Corporate	A future where clean, efficient and decentralized energy will power a smart electricity grid to deliver power efficiently to millions of homes; a world not suffering from water scarcity where waste is seen as a resource; where citizens' mobility and health care needs are all taken care of by efficient and comprehensive systems; and where they can live in sustainable cities with green spaces, clean air and a high quality of life.	Efficient, decentralized, energy, electricity, water, waste, green spaces, clean air and quality of life.	Dunlop (2012)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
46	Corporate	Urbanization, rapid population growth and shortages of resources are placing a new strain on city systems. So how can cities fuel economic growth whilst improving environment and social conditions? What must they do to raise service quality despite finite resources, and ever-growing demand? How can they work more effectively across the public sector, and with the private and 3rd sectors to transform outcomes? Smart technologies help city administrations tap into public information and create not just smarter, but more sustainable cities.	Fuel economy, technology, administrations, sustainable.	Capgemini (2014)
47	Corporate	"Smart Cities" are an effective response to today's needs which have become crucial. Thanks to the rapid, pressing trends seen throughout the world. In our view, the "smart city" is an urban model that minimizes efforts around "low level" needs and effectively satisfies "higher level" needs to guarantee an elevated quality of life while optimizing resources and areas for sustainability.	Quality of life, optimization, resources, sustainability.	ABB Group (2014)
48	Corporate	It takes more to build a smart city than simply using ICT to link and manage social infrastructure. Providing new values and services that residents truly need is also essential. Generating the knowledge to arrive at solutions by continuing to closely examine local issues, while putting this information into the equation when analysing the enormous amount of data from smartphones, various sensors, metres, and other devices, is a crucial task. Achieving it requires that Fujitsu put ICT to work to establish a sustainable social value cycle and create new innovations.	Knowledge, solutions, sensors, data, ICT, innovations, infrastructure.	Fujitsu (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
49	Corporate	The IBM vision for a smarter city uses technology to bring cities forward so that they can accomplish these types of objectives: – Quality of life for its citizens and visitors, – A well-managed city works to create an optimal urban environment for its citizens, visitors, and industries by focusing on urban design, energy and water management, and an efficient and easy-to-use transportation system. These cities provide better performing and reliable city services that enable simplified and integrated access to services. – A healthy and safe city addresses the health and safety of residents and visitors through innovations in local health care networks, disease management and prevention, social services, food safety, public safety, and individual information privacy. – A sustainable city implements concrete measures toward sustainability through, for example, reduced consumption of energy and water and reduced emissions of CO_2. Possible measures that can make a city sustainable include urban planning principles for mixed land use, architecture and construction principles for buildings, and methods to use rainwater instead of treated water. – A city with good governance strives to improve the quality and efficiency of city services. It mandates transparency and accountability at all levels of the government. It provides the means to listen, understand, and respond to the needs of its citizens and businesses.	Quality of life, water and energy consumption, networks, information.	Kehoe-IBM (2011a)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
		– A city that incorporates culture and events attracts visitors and keeps citizens interested in the city through investments in arts, culture, and tourism. These investments are a great way to draw attention to the city and a way to establish the city as a world-class location to live in. – A city focused on its citizens looks to address their needs by providing information and access to city services in a convenient and easy-to-use manner. When done rightly, both the citizens and the city government can benefit. This mechanism gives the citizens access to the information and services when needed and gives the city a means to share important information and obtain input from its citizens in a timely manner.		
50	Corporate	Business growth and development, building the city's economy: – A city of digital innovation focuses on using strategic investments in connectivity and communications (for example, wireless broadband either broadcast or through hotspots). It attracts cutting edge businesses in the industrial and high-tech fields and builds human and intellectual capital. – A city of commerce establishes itself as a local, regional, or national centre of commerce and economic development. It builds local expertise in a specific industry and the infrastructure and services to support continued growth and to remain competitive. – A city attracting and keeping skilled workers promotes itself as being a desirable place to locate to or to grow up and stay in.	Digital, commerce, building the city's economy, cost effective.	Kehoe-IBM (2011b)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
		This ability to maintain skilled workers is accomplished by anticipating and accommodating shifts in business needs, skills, local population, and demographics to offer economic opportunities. – A city with free flowing traffic identifies and manages congestion actively. This demand is accomplished by making various forms of transport (such as road, air, rail, and bus) cost effective and efficient.		
51	Corporate	IBM defines a smarter city as one that makes optimal use of all the interconnected information available today to better understand and control its operations and optimize the use of limited resources.	Information, operations, resources, optimize.	IBM Smarter City Assessment Tool (2009)
52	Corporate	Smart cities: Innovative urban developments that leverage ICT for the management of natural energy consumption at the community level and other technologies to balance environmental stewardship with comfortable living.	Innovation, urban, ICT, energy, community, technology, environment, living.	Fujitsu (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
53	Corporate – Derived from video	Cities are a complex and dynamic system. According to SAP, there are eight (8) fundamental factors that determine what defines a sustainable city: • Smart economy – Long-term prosperity, innovation, entrepreneurs, and social business models. • Good government – High performance. • Open society. • Resilience and sustainability – being clean and green. • Global attractiveness. • Human and social capital. • World-class financial expertise. • Excellent infrastructure – physical and soft infrastructure (technology, research and knowledge).	Smart economy, good government, open society, global attractiveness, human and social capital, infrastructure, knowledge, technology.	SAP (2014)
54	Corporate definition derived	Smart is a combination of collaborative leadership, policy and legal, customer insight, budget and performance management, service orientation and technology.	Leadership, policy, customer, service orientation, technology.	Colclough-Capgemini (2011)
55	Corporate CSR	In a broader definition, a city can be considered as "smart" when its investment in human and social capital and in communications infrastructure actively promotes sustainable economic development and a high quality of life, including the wise management of natural resources through participatory government.	Human capital, social capital, communication, economic growth, economic development, sustainability, quality of life, natural resource management, participatory government.	Hirst-European Investment Bank (2012)
56	Corporation	A smart city is a city that meets its challenges through the strategic application of ICT goods network and services to provide services to citizens or to manage its infrastructure. A sustainable city is a city that meets the needs of the present without compromising the ability of future generations to meet their own needs.	ICTs, citizens, environment, social, economic growth.	Lovehagen-Ericsson (2013)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
57	Government/ International organization	Traditionally, a "smart sustainable city" has been defined as a city that uses information and communication technology to make both its critical infrastructure, its components and utilities more interactive, efficient, making citizens more aware of them.	ICT, interactive critical infrastructure, interconnectivity, efficiency, awareness.	Azkuna (2012a)
58	Government/ International organization	In preparing this report, we used the smart sustainable city model, which identifies the presence and convergence of six areas: economy, mobility, environment, citizenship, quality of life, and, finally, management. A city can be defined as smart when it displays a positive performance in these six areas, and when it has been built based on a "smart" combination of elements (communication, infrastructure, economic development) and on purposeful and independent citizen activities (participation, education) that make sound management of natural resources through participatory governance.	Convergence, integration, economy, mobility, environment, citizenship, quality of life, communication, infrastructure, economic development, citizen participation, education, natural resource management, participatory governance.	Azkuna (2012b)
59	Government/ International organization	A type of city that uses new technologies to make them more liveable, functional, competitive and modern, the promotion of innovation and knowledge management, bringing together six (6) key fields of performance: economy, mobility, environment, citizenship, quality of life and, finally, management.	Liveable, technology, citizens, quality of life, management, economy.	Azkuna (2012c)
60	Government/ International organization	Smart sustainable cities combine diverse technologies to reduce their environmental impact and offer citizens better lives. This is not, however, simply a technical challenge. Organizational change in governments – and indeed society at large – is just as essential. Making a city smart is therefore a very multidisciplinary challenge, bringing together city officials, innovative suppliers, national and EU policymakers, academics and civil society.	Diverse technology, environment, quality of life, city officials, suppliers, policy makers, academics, civil society.	European Commission (2014)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
61	Government/ International organization	A real smart city develops the city to reach the aim of improving the quality of life. It needs sound and innovative economic development as a means to reach this aim. Uses ICT as a tool with a great potential for ameliorating daily life, public services and the economy.	Quality of life, innovative, economic, ICT, public services.	Schweiker - Council of European Municipalities (2010)
62	Academic	Amsterdam Smart City uses innovative technology and the willingness to change behaviour related to energy consumption in order to tackle climate goals. Amsterdam Smart City is a universal approach for design and development of a sustainable, economically viable programme that will reduce the city's carbon footprint.	Smart city, innovative, technology, energy, economically, carbon footprint.	Lee *et al*. (2012)
63	Government/ International organization	There are three major functions that "ICT Smart Town" is expected to contain. ICT to be used both in ordinary times and in times of disaster. ICT is used in order to contribute to self-sustaining town development in ordinary times, while it functions for disaster prevention and mitigation in times of disaster. Users, mainly local citizens, can participate in the Smart Town community using the ICT system through user-friendly and accessible interfaces such as mobile phones and TVs. New services resulting from the use of "Big Data", including the government-held (public) data, private sector data and real-time data, collected through sensors.	Disaster, citizens, smart town, community, interfaces, government, real-time data.	Japan Ministry of Internal Affairs and Communications (2013)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
64	Government/ International organization	Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and finance to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society.	People, quality of life, energy, materials, sustainable, economic, urban planning, society.	European Commission (2013)
65	Government/ International organization	A "city" can be defined smart when systematic information and communication technologies and resource-saving technologies are used to work towards a post fossil society, to reduce resource consumption, enhance permanently citizens' quality of life and the competitiveness of local economy – thus improving the city's sustainability. The following areas are at least taken into account: energy, mobility, urban planning and governance. An elementary characteristic of a smart city is the integration and cross-linking of these areas in order to implement the targeted ecological and social aspects of urban society and a participatory approach.	Energy, mobility, urban planning, governance, integration, ecological, ICT.	Homeier-City of Vienna (2013)
66	Government/ International organization	Create a real shift in the balance of power between the use of information technology by business, government, communities and ordinary people who live in cities.	Power, information technology, business communications, government, people.	Deakin-European Commission (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
67	Corporate	A smart city offers its inhabitants a maximum of life quality by a minimum use of resources thanks to intelligent combination of different infrastructure systems (transport, energy communication, etc.) on different levels like buildings, areas, quarters and cities. «Intelligent» in this context does not automatically mean "IT". By similar performance, passive or self-regulating mechanisms is preferable to active regulated systems.	Quality of life, infrastructure systems, intelligence.	Horbaty-Energie Schweiz (2013)
68	Academic	"...are territories with a high capacity for learning and innovation, which is built into the creativity of their population, their institutions of knowledge creation and their digital infrastructure for communication". .... [and are concerned] with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.	Learning, innovation, creative people, knowledge institutions, communication infrastructure.	Hollands (2008)
69	Industry association	The Council defines a Smart Sustainable City as one that has digital technology embedded across all city functions.	ICT, integrated, city functions.	Smart Cities Council (2014)
70	Government/ International organization	"At its core a smart city is a welcoming, inclusive city, an open city. By being forthright with citizens, with clear accountability, integrity, and fair and honest measures of progress, cities get smarter".	Integrity, citizens.	Comstock-World Bank Blogs (2012)
71	Internet	A developed urban area that creates sustainable economic development and high quality of life by excelling in multiple key areas: economy, mobility, environment, people, living, and government. Excelling in these key areas can be done through strong human capital, social capital, and/or ICT infrastructure.	Economic growth, standard of living, quality of life, transport, mobility, environment, governance, human capital, social capital, ICT, urban area.	Business Dictionary (2014)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
72	Corporate	Framing the "triple bottom line" of economy, environment, and social equity in one big picture. We are working to get our arms around a more sustainable future – a better way to connect people, homes, jobs and places – as a metro area and region, with more transportation choices. Frankly, it is a very tough challenge.	Metro, economy, environment and social equity, transportation, interconnecting people, home, jobs and places.	Ott-HBR Blog Network (2011)
73	ITU	A "smart sustainable city" is mainly based on the information and communication technologies. Through the transparent and full access to information, the extensive and secure transmission of information, the efficient and scientific utilization of information, SSC increases the urban operational and administrative efficiency, improves the urban public service level, forms the low-carbon urban ecological circle, and constructs a new formation of urban development.	ICT, information access, information utilization, operational efficiency, administrative efficiency, services, low carbon, urban development.	FG-SSC-0005 (2014)
74	ITU	Smart sustainable cities are well managed, integrated physical and digital infrastructures that provide optimal services in a reliable, cost effective, and sustainable manner while maintaining and improving the quality of life for its citizens. Key attributes of a smart sustainable city are mobility, sustainability, security, reliability, flexibility, technology, interoperability and scalability. Foundational aspects include economy, governance, society and environment with vertical infrastructures such as mobility, real estate and buildings, industrial and manufacturing, utilities - electricity and gas, waste, water and air management, safety and security, health care and education. All of these are woven into a single fabric with ICT infrastructure as a core.	Well managed, integrated, digital infrastructure, optimize services, sustainability, quality of life, mobility, security, reliability, flexibility, technology, interoperability, scalability, economy, governance, society, environment, real estate and buildings, industrial and manufacturing, utilities - electricity and gas, waste, water and air management, safety and security, health care and education, integrated, ICT.	FG-SSC-0013 (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
75	ITU/ Government	It is a city with a large, efficient and widespread technological network that fosters dialogue between citizens and everyday objects. It integrates the huge amount of information available to generate intelligence and improve daily life in a lifestyle that is increasingly "smart". It combines innovation with the environment, mobility and quality of life. It is a new phenomenon, complex and rapidly changing. Technological innovation moves in several directions (green buildings, smart mobility, e-health, e-government, etc.).	ICT, integrated, quality of life, innovation, environment, mobility, green buildings, health, environment governance.	FG-SSC-0014 (2013)
76	ITU	ICT spans across a number of application sectors that characterize the framework of smart sustainable cities. Among others, energy, buildings, transport and mobility, water and waste management.	ICT, sustainability, energy, buildings, transport, mobility, water management, waste management.	FG-SSC-0020 (2013)
77	ITU	"A Smart Sustainable City has been defined as a 'knowledge', 'digital', and 'cyber' or 'eco' city; representing a concept open to a variety of interpretations, depending on the goals set out by a Smart Sustainable City's planners. We might refer to a Smart Sustainable City as an improvement on today's city both functionally and structurally, using information and communication technology (ICT) as an infrastructure. Looking at its functions as well as its purposes, a Smart Sustainable City can perhaps be defined as "a city that strategically utilizes many smart factors such as Information and Communication Technology to increase the city's sustainable growth and strengthen city functions, while guaranteeing citizens' happiness and wellness."	ICT, strategic resource utilization, sustainability, growth, services, citizen happiness, citizen wellness.	Hwang *et al*. (2013)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
78	Magazine	Smart sustainable cities use information and communication technologies (ICT) to be more intelligent and efficient in the use of resources, resulting in cost and energy savings, improved service delivery and quality of life, and reduced environmental footprint – all supporting innovation and the low-carbon economy.	ICT, cost efficiency, energy efficiency, energy savings, quality of life, environment, improved service delivery, innovation, low carbon economy.	Cohen (2011)
79	Magazine	An eco-city is defined as a city in which citizens, business and government sustainably work, live and interact through delivery of integrated, low carbon products and services. The objective of this project is to build a new industrial community to maximize the welfare of the people and minimize carbon emission. The above vision can be achieved by integrating technology across water, waste, energy, transportation and safety infrastructure while taking measures like maximum utilization of renewable resources for electricity supply, minimum loss of natural resources and others.	Sustainably, integrated, low carbon products and services, maximize welfare, industrial community, integrated technology.	Manesar (2011)
80	User centric	"The use of Smart Computing technologies to make the critical infrastructure components and services of a city-which include city administration, education, healthcare, public safety, real estate, transportation, and utilities-more intelligent, interconnected, and efficient" (58).	Computing technologies, interconnected components, city administration, education, healthcare, public safety, real estate, transportation, utilities, efficiency.	Washburn *et al*. (2010)
81	User centric	A smart sustainable city is characterized by the integration of technology into a strategic approach to sustainability, citizen well-being, and economic development.	ICT, integrated, sustainability, citizen well-being, economic development.	Woods *et al*. (2013)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
82	User centric	The terms "smart" and "intelligent" have become part of the language of urbanization policy, referring to the clever use of IT to improve the productivity of a city's essential infrastructure and services and to reduce energy inputs and CO_2 outputs in response to global climate change.	ICT, infrastructure productivity, services, low carbon, environment.	Hodkinson, S. (2011)
83	User centric	A smart sustainable city is one that "uses information and communications technologies to make the critical infrastructure components and services of a city – administration, education, healthcare, public safety, real estate, transportation and utilities – more aware, interactive and efficient."	ICT, administration, education, health care, public safety, real estate, transportation, utilities, integrated, efficient, interactive.	Belissent (2010)
84	User centric	An urbanized area where multiple public and private sectors cooperate to achieve sustainable outcomes through the analysis of contextual information exchanged between them. The sectors could include hospitals or emergency services or finance and so on. The interaction between sector-specific and intra-sector information flows results in more resource-efficient cities that enable more sustainable citizen services and more knowledge transfer between sectors.	Information exchange, integrated, resource efficiency, services, sustainability.	Maio (2012)
85	User centric	Cities need to differentiate themselves to attract investment and productive residents, and this is coupled with constrained financial resources, fast-growing populations, and aging infrastructures, is driving investment in smart sustainable city solutions. Smart sustainable city solutions leverage ICT not only to deliver higher-quality citizen services more efficiently but also to effect behavioural change in government workers, city businesses, and citizens so that cities can develop more sustainably.	ICT, services, efficient, development and behavioural change in government workers, city businesses, and citizens.	IDC (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
86	User centric	It is precisely because of the importance of cities and the need to deepen knowledge of urban issues that we undertake the study. The effort to question and understand where cities are and where they are headed benefits all of us in a world urbanizing like never before. This includes the officials and policymakers setting the course, businesses invested in city well-being, and the citizens who build their lives in thousands of city neighbourhoods worldwide, rich or poor, picturesque or prosaic.	Policymakers, business, well-being, urbanizing.	Ernst & Young (2014)
87	User centric	Many cities are exploring the "Smart City" or "Intelligent Community" concept to improve efficiencies, optimize how they use largely finite resources and become better places to live and make business. They are deploying new information and communications technology to strengthen social and business services across different sectors and to build an intelligent digital nervous system supporting urban operations. By incorporating information and communications technology and strategically exploiting the vast amounts of data they generate, smart cities can make buildings more efficient, reduce energy consumption and waste, and make better use of renewable energy. They can manage traffic intelligently, monitor how infrastructure performs, provide better communications infrastructures, deliver services much more efficiently, and enhance citizens' access to government.	Social, business, efficient, renewable, monitor, infrastructure, citizens, government, ICT, energy consumption.	Craren *et al.* (2012a)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
88	User centric	What makes a city tick? "Justice remains the appropriate name for certain social utilities which are vastly more important, and therefore more absolute and imperative, than any others," John Stuart Mill wrote in Utilitarianism in 1861. He added, "education and opinion, which have so vast a power over human character, should so use that power to establish in the mind of every individual an indissoluble association between his own happiness and the good of the whole." Many of those we spoke with this year in developing Cities of Opportunity agree. The foundations of healthy cities remain rule of law and safety and security today, as well as strong education to foster those qualities for future generations.	Justice, education, happiness, healthy, security, safety.	Craren *et al.* (2012b)
89	User centric	Smart city is characterized by the integration of technology into a strategic approach to sustainability, citizen well-being, and economic development. Smart city projects span several industry and operational silos: energy, water, transportation, buildings management, and government services. Most importantly, the smart city concept promotes new integrated approaches to city operations, leading to innovation in cross-functional technologies and solutions.	Technology, well-being, economic development, energy, water, transportation, buildings, government, innovation, technology.	Woods *et al.* (2013)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
90	User centric	According to Deloitte the three market drivers of smart cities are smart water, smart energy and smart agriculture. Smart water is increasingly seen as a component of ambitious smart city programmes that address the myriad of problems created by mass urbanization. Smart energy – the race for more and more energy sources is driving an increase in unconventional oil and gas exploration – in turn driving significant water and wastewater issues. Smart agriculture – the challenge to feed a growing global population is stressing food systems in both the developed and developing world and requires novel agricultural solutions.	Solutions, water, agriculture, energy, population,	Haji (2013)
91	User centric	The definition of sustainable development comprises five categories. Basic needs. Access to safe water, sufficient living space, adequate health care, and education are fundamental priorities for urban populations. Resource efficiency. A city's efficiency in such areas as the use of water and energy and the effective recycling of waste directly correlates to the quality of life of its citizens. Environmental cleanliness. Limiting exposure to harmful pollutants is fundamental to a city's liveability. Built environment. Equitable access to green space, public transportation, and dense, efficient buildings makes communities more liveable and efficient. Commitment to future sustainability. An increase in the number of employees and the level of financial resources devoted to sustainability suggests how committed city governments are to implementing national and local policies and standards.	Water, living space, health care, urban populations, energy, recycling, quality of life, pollutants, cleanliness, efficient, policies and standards.	Bouton *et al.* (2012)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
92	Non-profit	A city "combining ICT and Web 2.0 technology with other organizational, design and planning efforts to de-materialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and liveability."	ICT, web 2.0, bureaucratic efficiency, city management, innovative solutions, sustainability, liveability, standard of living.	Toppeta (2010)
93	Conference	What makes a city smart? A non-vendor driven definition of a 'Smart Sustainable City' The closer a city behaves to the ethos of the Internet, the smarter it is. That means the city is a platform – an enabler for the people. So, empowering people is at the centre of the perfect storm. So, what does a Smart Sustainable City look like? A city can be defined as smart when investments in human and social capital and traditional (ex-transport) and modern (ex-ICT) communications infrastructure fuel sustainable economic development and a high quality of life with a wise management of natural resources through participatory governance.	People enabler, human capital, social capital, traditional communication, modern communication, ICT, economic development, quality of life, natural resource management, participatory governance.	Jaokar (2012)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
94	Others	Seven (7) important elements in most cases of a smart sustainable city (Source: Xi She): 1) sensible – sensor sensing the environment ,2) connectable – networking devices bringing the sensing information to the web, 3) accessible – the broader information of our environment is published on the web, and is accessible to the user on the web, (web), 4) ubiquitous – the user can access information through the web, but more importantly through the use of the mobile (mobile), 5) social – the user acquires the information, and publishes it through his social network (social network), 6) Sharing – sharing is not limited to data but also to the physical object, when some objects are in free status, people can get the notification and use it. (web, mobile), 7) visibility/augmented – to retrofit the physical environment, make the hidden information seen not only through the mobile device by individuals but also with the naked eyes in a more border range like street signs.	Sensor monitoring, Internet connectivity, information availability, mobile, visible.	World Smart Capital (2012)
95	Industry	A smart city is a city that employs ICT infrastructures by sensing, transmitting and utilizing information in order to fulfil information sharing and service collaboration, further improve citizens' livelihood standards and their quality of life, increase urban operation efficiency and public service level, enhance the quality of economic development and industry competitive ability, and realize the scientific and sustainable development of the city.	Sensing, transmitting, ICT infrastructure, information, collaboration, quality of life, urban efficiency, economy, competitive, scientific, sustainable.	China Communication Standards Association (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
96	Government	Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and finance to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society.	Systems, people, energy, materials, services, finance, sustainable, economic, resilience, quality of life, ICT infrastructure, urban planning, responsive, social.	European Innovation Partnership on Smart Cities and Communities
97	Academic	Main features to be included in smart city administration: (i) Quality of life, (ii) Sustainable resource management, (iii) Cultural facilities, (iv) Health facilities, (v) Sustainable and innovative and safe transport systems, (vi) Environmental protection.	QoL, resources, sustainability, environment, health, transport, mobility.	Vienna University of Technology, University of Ljubljana, Delft University of Technology (2007)
98	Academic	Eco-cities focus on: (i) entrepreneurship, (ii) environment, (iii) sustainable urban development.	Business, environment, sustainability.	Rapoport, E. (2014)
99	Academic	Smart cities should focus on: (i) improvement of urban living capacity, (ii) resource efficient development, (iii) low carbon economy, (iv) use of ICT to manage complex urban system.	Urban, resources, economy, people.	Alusi, A., Eccles, R. G., Edmondson, A. C., Zuzul, T. (2011)
100	Academic	Smart city triple helix: human and social relations connecting the intellectual capital, natural wealth and governance of their regional development.	People, intelligent, development, governance and administration, natural, resources.	Njikamp, Lombardi, P., Giordano, S., Caraglui, A., Del Bo, C., Deakin, M.

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
101	Academic/ Corporate	Key aspect of smart cities is a plan for efficient management of utilities enabled by technologies such as those entailing smart metering of the residential consumption of electricity, water or gas.	Technology, utilities, efficient, water, electricity.	Monedero, D. R., Bartoli, A., Hernandez-Saerrano, J., Forne, J., Soriano, M. (2013)
102	Academic	Features of smart cities involve the use of discrete future Internet technologies (RFID), improving e-governance, providing and environment for innovation.	ICT, technology, governance and administration.	Balloon, Pieter, Glidden, J., Kranas, P., Menychtas, A., Ruston, S., Van der Graaf, S. (2011)
103	Academic	Typology of smart city functions: (i) Smart economy (competitiveness): innovative spirit, entrepreneurship, economic image, productivity. (ii) Smart mobility (transport and ICT): local accessibility, availability of ICT infrastructure, innovative and safe transport systems. (iii) Smart people (social and human capital): level of qualification, flexibility, creativity, participation in public life. (iv) Smart environment (natural resources): pollution control, environmental protection, sustainable resource management. (v) Smart governance (participation): decision-making, transparent governance, political strategies and perspectives. (vi) Smart living (quality of life): cultural activities, health conditions, housing quality, education facilities, touristic attractiveness, social cohesion.	Economy, business, competition, mobility, transport, social, people, capital, society, environment, sustainable, resources, natural, efficient, governance and administration, QoL, education, health, buildings.	Batty, M. Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., Ouzounis, G., Portugali, Y. (2012)
104	Academic	Smart cities should be centred around ecological modernization with an emphasis on business opportunities associated with a move to low carbon economy.	Environment, business, resources, efficient, economy.	Antrobus, D. (2011)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
105	Academic	"Smarter cities" has the following four components: (i) the application of a wide range of electronic and digital technologies to communities and cities, (ii) the use of information technologies to transform life and work within a region, (iii) the embedding of such ICTs in the city, (iv) The territorialisation of such practices in a way that brings ICTs and people together so as to enhance innovation, learning, knowledge and problem solving that the technologies offer.	ICT, technology, QoL, community, public, innovations, society, intelligent.	Allwinkle, S., Cruickshank, P. (2011)
106	Academic	Urban dwellers should be provided with smart phones that provide advanced capabilities to connect to the Internet, determine the user's location as well as provide crowd-sourcing platforms.	Public, ICT, community, participatory, actively, accessible, mobility.	Benouret, K., Ramalingam, R. V., Charoy, F. (2013)
107	Academic	"A smart city is generally meant as a city capable of joining competitiveness and sustainability by integrating different dimensions of development and addressing infrastructural investments able to support economic as well as the quality of life of communities, a more careful management of natural resources, a greater transparency and participation to the decision making process."	Sustainable, participatory, society, quality of life, integrate, resources, competitive, investment, economy, community, transparency, active, development.	Papa, R. (2013)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
108	Academic	Findings denote that smart cities should include the following dimensions: (i) Urban openness: making information visually available, participatory services to drive civic engagement. (ii) Service innovation: using ICTs to drive development in health, welfare, education, transportation, sectors, etc. (iii) Partnership formation: partnerships for building effective smart cities (central government, state government, private bodies, NGO involvement), direct vs indirect involvement, contracted/outsourcing development. (iv) Smart city integration: smart service access over multiple device platforms, app-based formatting of service information. (v) Smart city governance: Smart city teams involved with strategy, policy, and infrastructure and include ICT-based performance evaluation and feedback channels.	Accessible, participatory, ICT, governance and administration, investments, transport, business, health security and safety, urban, design, innovation.	Lee, J. H. Hancock, M. G., Hu, M. (2012)
109	Corporate	IBM Smarter Cities Initiative: " (a) is a long term process aiming to transform city based technologies and, in the process, help cities achieve their strategic vision; (b) recognizes that the needs and aspirations of each city may be very different; (c) requires partnerships (across many clients and with other delivery partners) to achieve the desired large scale transformations; (d) is based heavily on dimensions from IBM's global Smarter Planet strategy of which there are many applications (smart education systems, cloud computing, risk assessments, ICT based platform for exchange of ideas etc.)."	Vision, solutions, design, management, business, education, ICT, technology.	Paroutis. S., Bennett, Heracleous, L. (2012)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
110	Academic	"The basic concept of the Smart Cities initiative can be expressed as follows: the Smart Cities initiative seeks to improve urban performance by using data, information and IT to provide more efficient services to citizens to monitor and optimize existing infrastructure, to increase collaboration between economic actors and to encourage innovative business models in both public and private sectors".	Urban, ICT, innovation, people, economy, business, public, information, management, services.	Llacuna, M. L. M. Llinas, J. C., Frigola, J. M. (2014)
111	Academic	Five successful factors for a smart city: (i) broadband connectivity, (ii) knowledge workforce, (iii) digital inclusion, (iv) innovation, (v) marketing, (vi) advocacy.	ICT, education, technology, innovation, business, communication.	Kramers, A., Hojer, M., Lovehagen, N., Wangel, J. (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
112	Academic	"The concept of Smart City as a means to enhance the life quality of citizen has been gaining increasing importance in the agendas of policy makers". The main domains of a smart city include: (i) Employing ICT to deliver energy, enhance entrepreneurship and enable information exchange about consumption between providers and users with the aim of reducing costs and increasing reliability and transparency of energy supply systems. (ii) Public lighting, natural resources and water management. (iii) Waste management: Using innovations to manage waste generated by people, businesses and city services. This includes waste collection, disposal, recycling and recovery. (iv) Environment: Technology used to manage environmental resources and related infrastructure. This is done with the aim of improving sustainability. (v) Transport: Using sustainable public transportation based on environmentally friendly fuels and innovative propulsion systems. (vi) Healthcare: ICT applications and remote assistance to prevent and diagnose diseases. Improved access to health care systems. (vii) Public security: Use of ICT to assist with security issues like fire. ICTs may also be of help to the police department. (viii) Education and culture: Using ICTs to create opportunities for students and teachers, promote cultural events, manage tourism and hospitality. (ix) Public administration and governance: Promoting digitalized public administration, e-ballots and ICT-based transparency of government activities to enhance the empowerment of the inhabitants and involvement in administration.	Energy, economy, resources, management, water, environment, participatory, governance and administration, business, health security and safety, education, intelligent, ICT, innovation, natural, public, management, transport, utilities.	Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., Scorrano, F. (2014)

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Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
113	Corporate	Smart cities are aimed at: addressing urbanization, facilitating economic growth, enhancing technological progress using ICTs, environmental sustainability.	Urban, ICT, environment, innovation, technology.	Naphade, M., Guruduth, B., Harrison, C., Jurij, P., Morris, R. (2014)
114	Academic/International organization	Smart city establishments include: (i) Energy policy management, (ii) Healthcare governance, (iii) Financial policy management, (iv) Remote monitoring, (v) Complaint management, (vi) Intelligent buildings, (vii) Security systems based on ICT, (viii) IT configuration management databases.	Energy, health, security and safety, intelligent, ICT, management, buildings.	Asimakopoulou, E., Bessis, N. (2011)
115	Academic	"A city that monitors and integrates conditions of all the its critical infrastructures, including roads, bridges, tunnels, rails subways, airports, seaports, communications, water, power, even major buildings can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens."	Transport, energy, resources, society, integration.	Hall, R., E. (2000)
116	Academic	"A city striving to make itself smarter (more efficient, sustainable, equitable and livable)."	Sustainable, QoL, society, ICT, technology.	Nfuka, E., N., Rusu, L. (2010)

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Anexo 3 – Glosario de Términos

ANSI	American National Standards Institute
BSI	British Standards Institution
EMF	Electro-Magnetic Field
FG-SSC	Focus Group on Smart Sustainable Cities
IEEE	Institute of Electrical and Electronics Engineers
IEC	International Electrotechnical Commission
ICT	Information and Communication Technology
ISO	International Organization for Standardization
IT	Information Technology
IUN	International Union for Conservation of Nature
KPI	Key Performance Indicator
MRT	Mass Rapid Transit
NGO	Non-Governmental Organization
QoL	Quality of Life
RFID	Radio Frequency Identification Device
SCC	Smart Sustainable City
SDO	Standards Development Organization
SG	Study Group
UNEP	United Nations Environment Programme
WG	Working Group
WHO	World Health Organization
WWF	World Wide Fund for Nature