

Keynote: "A Smart World: A Development Model for Intelligent Cities"

[[The Trinity World of Trinity Cities](#)]

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SUMMARY

Demographic, environmental, economic, political, and socio-cultural factors are forcing the world to become more efficient, rational, dynamic, intelligent, technological, and self-sustaining, or smart and sustainable. The 21st century necessitates the wholly new development principles, policies, processes, and objectives: sustainable world strategies, comprehensive planning, integrated models, and globally effective solutions. The world is requested to synergistically driven by natural capital, social capital, technological and digital capital, like as the Global Internet/Web of Things, Knowledge and Social Intelligence and Renewable Energy Sources. Such a New World is emerging as a Smart World, converging the Cyber, Social, and Physical Domains (see the World Trinity Diagram).

The Smart World concept makes a foundational framework for the whole European Community, its EU 2020 Strategy for smart, sustainable and inclusive growth. The Smart World concept makes a basis for global industrial initiatives of the IBM's Smarter Planet and the Cisco's Intelligent Urbanization as well as the Eco City development models.

The power and beauty of the idea of Smart World consists in its capacity to merge three different worlds as one integrated whole: an Eco World, Digital World and Social World. It thus unifies the ecological principles of the eco world development, the technological principles of the information world development, and the social principles of the human world development. Accordingly, a truly sustainable community (city, region, or country) is a geographical entity which is digitally smart, socially intelligent, and ecologically sustainable. Geographically, a Smart Community can be a real estate/property development, an urban economic development zone, a city, a district, a region, a mega-region, a country, an international community, or a global community.

At the community level, the Smart World is a Smart Eco Planet of intelligent sustainable communities: countries, regions, cities, towns, villages, districts, and neighborhoods. The Smart Eco Planet is mostly about intelligent communities, natural ecosystems, digital economy, intelligent people, smart governance, smart transport and intelligent ICT networks, smart environments, eco-smart living and creative working in intelligent eco-buildings, cities, regions, countries, forming a global innovation ecosystem.

Demographic, environmental, economic, political and socio-cultural factors are forcing the urban world to design and implement smart/intelligent cities. As a special type of sustainable community, a smart city is a unified urban entity with three critical layers/levels/spaces, all planned, developed and managed as its integral parts:

- **Digital/ICT/Hi-Tech/Ubiquitous/Cyber/Mobile/Digitally Smart and Intelligent City** (Digital/Information Capital; Digital Urban Spaces, Multi-Play Telecom Network, ICT spaces/systems/applications, Sensor Networks, Ubiquitous Computation, Cloud Computing, Network-integrated Real Estate, City OS, Intelligent City Management Platform, Augmented Virtual Reality, Virtual Lifestyle);
- **Sustainable/Ecological/Green/Zero-Carbon/Zero-Waste/Eco Friendly/Clean City** (Natural Capital; Natural Urban Spaces and Ecosystems, Green Energy Network, Real Eco Estate, Ecological buildings, Green Lifestyle);
- **Knowledge/Learning/Innovation/Intelligent/Science/Intellectual/LivingLab/Creative/Human/Social City/Noopolis** (Knowledge Capital; Innovation Systems, Meaningful Urban Spaces, Collective Intelligence, Knowledge Triangle/Ecology, Health Triangle, Human Social City, Intelligent/Smart Lifestyle).

A truly smart city is three innovative cities in one, **the Urban Trinity of Information Cyber City, Intelligent/Knowledge City and Ecological/Clean city. It is essential to draw distinctions between a smart city, as a unified urban entity, and "smart city" technologies, applications, and systems, as well as fragmented "smart city" projects, lacking the overall conception of the smart city project and resulting in unsustainably over-costly ventures.**

The 21st-century smart cities are best to be modeled and developed as the Trinity City of Intelligent ICT networks, Social Intelligence Networks, and Clean Energy Networks. Such Smart Cities, as globally networked innovative ecological urban areas, are key preconditions for the Smart World of Intelligent Communities.

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INTRODUCTION: Towards a Smart World, or the Trinity World of Trinity Cities

The current world faces an increasing number of planetary challenges involving Environment, Energy, Food, Water, Transportation, Infrastructure, Society, Healthcare, Education, Governance, and Economy. The beginning of the 21st century has been marked by international terrorism, world crisis, regional wars, and civil unrests. On the upside, it intensified the digital revolution, technological revolution, environmental revolution as well as social revolutions shaping more integrated, inclusive, or sustainable world.

Humans advance science, technology and industry to create more wealth, thus to overcome social injustices and social ills prevalent today - hunger, poverty, unemployment, illiteracy, diseases, wars, environment degradation, and many other social evils. These global problems still continue because of the dominant economic and political self-interests, missing to form the self-organized, spontaneous global order, a sustainable world, sustaining the self-organizing processes of human life-supporting systems: ecological, social, economic, technological, and cultural.

Sustainable global order is a spontaneous emergence of various kinds of human orders from a combination of self-interested individuals, organizations, and social groups, and national interests of countries and regions, who are trying to sustain self-organizing processes through different types of planning, local, business, urban, economic, strategic, spatial, environmental, or national. Being found in physical and biological worlds, society, economics, and natural ecosystems, the self-organizing processes cover a free market economy, human culture, the Internet, the natural evolution on Earth, as well as the world.

The New World is uniting an Eco World, Digital World and Social World into the **Trinity World**, unifying the ecological principles of the eco world development, the technological principles of the information world development, and the social principles of the human world development. It's thus emerging as a Smart Eco Planet of eco-intelligent social communities of various geographical sizes and scales: countries, regions, cities, towns, villages, districts, and neighborhoods. Combining spontaneous order principles and smart communities planning, the Smart New World is self-organizing as global knowledge ecosystems, involving natural ecosystems, social cohesion, smart economy, intelligent people, efficient global governance, complete mobility, sustainable living and creative working.

Accordingly, the New World of new cities calls for converging models, initiatives, principles, strategies, standards, solutions, and technologies. It requires merging all its key domains, physical, natural, digital and knowledge worlds, assets, and resources to develop a smarter world with intelligent eco-communities and integrated infrastructures, such as the Future Internet/Web of Things or distributed RES Networks, the replacement of the unsustainable fossil fuel infrastructures.

Our research and innovative practice, added up with the good and best cases studies, are proving that a true sustainable community is a physically efficient, digitally smart, socially intelligent, and ecologically sustainable community, driven by physical capital and natural capital, social capital and digital capital. Following the overall concept of Smart World, a real smart city is the **Trinity City** (Smart Sustainable City, Intelligent Eco City, or Intelligent Eco Cyber City), converging physical assets and technological assets, natural resources and knowledge assets, human resources and intellectual capital (see the WORLD Trinity Diagram).

THE RISE OF THE SMART CITY

The significant part of the world's wealth is in the form of urban land and buildings, commercial property and residential property and infrastructure capital. The real estate, and now the world's population, is mostly concentrated in an urban area, as a town, large town, city, large city, metropolis, conurbation, megalopolis (unified super-city), or ecumenopolis (the urban world).

Just a decade ago, the 7 largest megalopolises (Indo-Gangetic Plain, Pearl River Delta, Blue Banana, Yangtze River Delta, Taiheiyō Belt, Great Lakes Megalopolis, and Northeast Megalopolis as Boston - Washington) covered about 10% of human population, so taking a lead in overpopulation, energy consuming, air, water, light, and soil pollution, urban sprawling, ecosystems degradation, and unsustainable urbanization.

On the other side, cities are engines of innovation, economic growth, and technological progress, and the way for the legacy cities to reveal the better or smarter part is becoming greener, more intelligent, more efficient, more liveable, more attractive, more social, more digital, or just better: <http://www.scientificamerican.com/cities/>.

The distinction of any city is its capacity to aggregate people, skills, talents, resources, capital, businesses, government, and infrastructure, physical and social, supported with complex systems for land use, transportation, utilities, sanitation, housing, and public services.

Over the last several years we have seen how the concept of Intelligent or Smart Cities has been fast moving from the academic world of conferences and workshops to the strategic planning of national governments and primary commercial projects of global IT corporations, multinational infrastructure providers and system integrators.

Unlike the traditional legacy city, a smart city, new or retrofitted, is anticipated as a prime city of well being, prosperity and productivity. It is characterized as an innovative urban settlement with Intelligent Information and Communications Technology Infrastructure inbuilt in the Environment, Transport, Utilities and Energy Networks, Buildings, Social Infrastructure, Government, and Services.

As the smart city projects spread across the world, Nikkei Business Publications has conducted a research on the sunrise market and projected the market size of 3,1 trillion Euro for the next twenty years. Meantime, according to the Cisco's estimations, the emerging market of smart/ intelligent cities is projected over \$ 1 trillion in the next decade. Japan announced smart cities as the next export area (Japan News Net) competing with the USA and Korea. Following the predictions, it launched the Yokohama Smart City Project, a five-year pilot program, with a consortium of seven Japanese companies (Nissan, Panasonic, Toshiba, Tokyo Electric Power, Tokyo Gas, Accenture (Japan) and Meidensha) and the City of Yokohama. Presently, the global role of cities is just overwhelming. Being the principal source of economic growth, financial and political power, the cities are key contributors to the national GDP, like Chinese cities will contribute 90% of China's GDP by 2013. On the downside, the world's urbanization is bringing social division, natural and urban ecosystems damages, environmental degradation, air, soil, water, and energy pollution, in all generating 80% of global harmful emissions and accounting for 75% of the world's energy consumption.

To better the urban world, there are now well-promoted smarter world/cities global initiatives, as the IBM's Smarter Planet, Cisco's Intelligent Urbanization, or Smart + Connected Communities. This is added up with the public initiatives like EU 2020 Strategy for smart, sustainable and inclusive growth, UN Compact Cities Program, EU Initiatives on Smart Cities and Communities.

The number of smart cities projects is hardly to count as the number of the corporate reports on smart cities (see the corporate reports, mostly free downloaded). Just one global IT corporation, IBM, is boasting of being involved in about 2000 smart city projects. According to the Intelligent Community Forum, more than 500 cities globally have been introduced with smart / intelligent characteristics.

There are smart cities projects in Asia, the Middle East, Europe, Americas, South and North, Russia, and Africa. The statistics show that over 2000 Smart City projects have been started or going on in Asia, Europe, the Americas and Africa: there have been 1500 by 2010, with an annual compounded growth rate of 20%.

Among the stakeholders, there are Governments, Municipalities, Property Developers, Utilities, IT Companies, Engineering Companies, Architectural Firms, Telecommunications Companies, Infrastructure Providers, Grid Providers, Building Systems Suppliers, and even Automakers.

Already, several new cities have been master-planned from scratch, on greenfield sites, as Putrajaya (Malaysia), Songdo and Incheon (Korea), King Abdullah Economic City (Saudi Arabia), GIFT, Lavasa, and Nano City (India), Wuxi Huishan and Dongtan and Meixi (China), Dubai Waterfront, Dubai Central, Masdar (UAE), Living PlanIT Valley (Portugal), Neapolis (Cyprus), and Skolkovo (Russia).

Since most of the world's assets, real estate assets, financial assets, natural resources and human assets, is aggregated in cities, any innovative change of urban development will cardinaly affect a whole global development.

The Smart Issues to be Addressed

- What is a real smart city, a truly sustainable city? What defines the true smart city, or what makes a city full sustainable?
- How to distinguish the common city, the smart city, the digital city, the intelligent city, the eco city, the knowledge city, and the innovation city?
- What are the key policies, strategies, standards, technologies, and issues of the smart city development?
- What are the main market drivers, opportunities and challenges for the smart city development?
- How do smart city models and projects differ across the world?
- Which financing models are used in the smart city development?
- Who are the key players in the smart city market and how do they relate to each other?
- How large is the global smart city technology market, and how will it be parted by type, strategy, technology, budget, industry sector, region, and ownership?
- What is smart branding and smart city branding?
- What is an intelligent nation? And how is this high status achieved?

WHAT IS NOT A SMART CITY

Nowadays, many municipalities are embracing the Smart City strategy, installing municipal wireline or wireless broadband networks; implementing e-government by providing a digital access to city departments' web sites; integrating public transit with intelligent facility systems; developing distributed RES networks cutting carbon footprints, applying eco principles to reduce, recover, recycle, and reuse the urban resources. Energy-efficient solutions, computer networks, intelligent building networks, digital networking equipments, data analytics software, optical telecommunications systems, smart mobile networks, smart/intelligent applications, technologies, devices, objects, and systems, intelligent sensor/actuator networks, intelligent traffic systems, smart community technologies, resources tracking systems, cloud computing, augmented reality, rich multimedia,

embedded control systems, ubiquitous computing environment, web 3.0, internet of things, all this and more just components, constituents, elements, factors or ingredients of a smart urban entity. It's merely enabling means of innovative cities, integrating new technologies to obtain a strategic goal of full sustainability, citizen well-being, and social development (see the Supplement).

When a city of the future is defined as "a community that is run on networked information providing integrated services" (Cisco), it's only part of truth, a small part of the big truth. The "Smart City" is hardly "to refer to cities, where infrastructure is built using new technologies and management systems that allow efficient use of energy sources and minimize negative impact on the environment", as the recent Smart City International Forum is promoting: <http://smart-expo.com.ua/?lang=en>.

Also, the smart cities are hardly only about sustainable/secure energy cities with low carbon technologies, with net-zero energy Buildings; Innovative Heating/Cooling, Smart Electricity, Smart Grids, Appliances and Metering, RES; Intelligent Traffic, and Sustainable Mobility, as to the European Initiative on Smart Cities, <http://setis.ec.europa.eu/about-setis/technology-roadmap/european-initiative-on-smart-cities>, and the recent EU Smart Cities and Communities Initiative by the Energy Commission, http://ec.europa.eu/energy/technology/initiatives/smart_cities_en.htm.

One thing is advanced technologies and solutions and smart systems for urban physical infrastructure, roads, structures, rail networks, power and utility grids, residential and commercial estates, public buildings, housing and households. Another thing is the integrated city of intelligent infrastructures, citizens, businesses, governance, smart mobility, smart environment, and connected communities.

Lacking the holistic concept of smart city can result in confusing methodologies, rankings, benchmarks and key performance criteria like it reflected in the report, "Smart Cities: Ranking of European medium-sized cities". An ostensive definition makes all the confusion: "A Smart City is a city well performing in 6 characteristics, built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens." Now, it lists 6 separate characteristics with specific factors as follows: Smart Economy (Competitiveness, innovation, productivity, entrepreneurship, trademarks); Smart People (Social and Human Capital, qualification, creativity, learning, plurality, participation); Smart Governance (Participation, strategies, services, transparency); Smart Mobility (Transport and ICT, accessibility, availability, innovative transport systems); Smart Environment (natural resource management, environmental protection, pollution, and attractive natural conditions); Smart Living (Quality of Life, Cultural facilities, Health conditions, Individual safety, Housing quality, Education facilities, Touristic attractiveness, Social cohesion).

As a consequence of such a loose definition, there are as many smart cities as falling into any category, of which Luxembourg is number one "smart city", better competing in "Smart Economy", "Smart People", "Smart Mobility", and "Smart Living": <http://www.smart-cities.eu/>.

It all looks we don't need any big effort for newly built fully sustainable cities of innovative infrastructures, digital intelligence, social cohesion, knowledge economy, intelligent communities, as far as the "smart cities", with their inefficient, pollution generating legacy transport and energy systems, partly retrofitted as old buildings or automobiles, are already here and there.

It could be safely noted that currently there is hardly any real smart city under construction, what leads to the rhetorical question "Will the Real Smart City Please Stand Up? Intelligent, Progressive or Entrepreneurial?": <http://www.tandfonline.com/doi/abs/10.1080/13604810802479126>

That means, we need to tackle a sustainable future community in all the possible complexity and wholeness, timely identifying all sorts of confusion, misrepresentation, misunderstanding, commercial hypes, empty promises, partialities, and all sorts of "greenwashing" or "smartwashing".

Being a place where the virtual and the real meet, merging into an augmented urban reality, a Real Smart City is emerging as a structured organic whole, single urban entity, completeness, totality, and integral unity of its parts, components, constituents, as a technologically, socially, and economically integrated/connected urban eco system.

Now, what is not a real smart sustainable city looks as follows.

It is not a conventional city/metropolis/urban center

It is not a digital city or wireless city

It is not an ecological city or green city or ecologically healthy city or quality urban system

It is not an intelligent city or knowledge city or social intelligence city or creative city

It is not a network-based smart + connected community

It is not a city only with a smart community

It is not a city only with a smart environment

It is not a city only with a smart economy

It is not a city only with a smart transportation

It is not a city only with smart utilities and energy systems

It is not a city only with smart education

It is not a city only with a smart public safety

It is not a city only with smart buildings

It is not a city only smart healthcare

It is not a city only with smart public administration

It is not a city only with business parks

It is not a city only with innovation clusters

A smart city is not public administration/authorities that deliver innovation services and infrastructure, based on information and communication technologies

Still, a smart city is not a city with a smart economy; smart mobility; a smart environment; smart people; smart living; and, finally, smart governance

It is not also a city with smart transportation, utilities, healthcare, education, public safety, or building systems management.

If the government is striving to advance ecological infrastructure, smart utilities, smart transport, smart buildings, smart economy, smart government, smart environment, smart lifestyle, or smart communities, in the fragmented ways, without an integrated, holistic regional/urban planning, it's hardly about a real smart city. Thus, **what is not a real smart city, it is not the trinity city; and what is not the trinity city, it is not a real smart city.** Then new energy cities, like Masdar, economic cities, like King Abdullah Economic City, or ICT cities, like Songdo or GIFT city, are hardly truly smart cities. For the real sustainable community strongly implies an extensive full sustainability modeling, digital, environmental, and social planning in the first place, what the Smart Group is promoting.

FRAGMENTED SMART CITY PROJECTS

1. Smart Economy (Innovation, Productivity, Innovative Spirit, Intellectual Property, Entrepreneurship, Knowledge Market/Industry, Openness)

Smart Economy: Holyoke, Massachusetts

Smart Economy: Kochi, India

Smart Economy: Malta

Smart Economy: Manado, Indonesia

Smart Economy: Nanjing, China

2. Smart Environment (Natural Capital and Resources, Sustainable Resource Management)

Smart Environment: Amsterdam, Netherlands

Smart Environment: Burlington, Ontario

Smart Environment: Dublin, Ireland

Smart Environment: Dubuque, Iowa

Smart Environment: Glasgow, Scotland, United Kingdom

Smart Environment: Lyon, France

Smart Environment: Malaga, Spain

Smart Environment: Peterborough, United Kingdom

Smart Environment: San Diego, California

Smart Environment: Shenyang, China

Smart Environment: Santa Barbara, California

Smart Environment: Stockholm, Sweden

Smart Environment: Sydney, Australia

Smart Environment: Yokohama, Japan

3. Smart Governance (e-Participation, public/social services, transparency, political strategies and perspectives)

Smart Governance: Chengdu, China

Smart Governance: Edinburgh, United Kingdom

Smart Governance: Matosinhos, Portugal

Smart Governance: Syracuse, New York

Smart Governance: Wilmington, North Carolina

4. Smart Lifestyle (Smart Living, Quality of Life)

Smart Lifestyle: Boise, Idaho

Smart Lifestyle: Houston, Texas

Smart Lifestyle: Johannesburg, South Africa

5. Smart Transportation (Smart Mobility, innovative, safe and sustainable transport systems and facilities)

Smart Transportation: Alameda County, California

Smart Transportation: Alcoa, Tennessee

Smart Transportation: Portland, Oregon

Smart Transportation: Southampton, United Kingdom

6. Smart Community (Social Cohesion, Unity in Community, Human Infrastructure, Interfaces, Integration)

Smart Community: Chattanooga, Tennessee

Smart Community: Dublin, Ohio

Smart Community: Eindhoven, the Netherlands

Smart Community: Issy-les-Moulineaux, France

Smart Community: Luxembourg

Smart Community: Queensland, Australia

Smart Community: Stratford, Ontario, Canada

Smart Community: Windsor-Essex, Ontario, Canada

[ABI Research Report: <http://www.abiresearch.com/research/1007213-Smart+Cities#tables>]

WHAT IS A SMART CITY: The Trinity City, A Smart Sustainable City™

There are hundreds and hundreds of eco cities, innovation communities, smart cities, knowledge cities, and intelligent cities, but there is no smart city of full sustainability, social, economic, ecological and technological. The real smart city is a Smart Sustainable City, bringing together all the innovative characteristics associated with organizational change, technological, economic and social development of a modern city. “A city may be called ‘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 government” (Ovum).

In fact, a smart city involves three key forms of capital: technological and information capital, human and social capital, as well as physical and ecological capital. For “infusing intelligence into each subsystem of a city, one by one – transport, energy, education, health care, buildings, physical infrastructure, food, water, public safety, etc.—is not enough to become a smarter city. A smarter city should be viewed as an organic whole.” (HBS).

Within the physical-human-digital innovation environment, the intelligent city, the human and social intelligence, should predominate over the digital communication infrastructure, knowledge networks and management, as one of the pioneers of i-cities and the key member of the Smart Group confirms (Komninos).

So, real smart cities integrate digital cities, intelligent or knowledge cities, and green cities, following the eco city development principles, as stated by the Shenzhen Declaration on Ecocity Development. **What powers the smart cities, is the digital intelligent networks, the social intelligence and the green networks.**

Such a harmonious smart/sustainable city is a model of sustainable future, designed as the best place to live, to work, to learn and to visit. Its sustainable development model incorporates the most valuable concepts and practices of rising worldwide digital/smart cities, ecological communities, intelligent cities and knowledge clusters and territorial systems of innovation, as technopoles, clusters, technology parks and districts, and knowledge networks.

A true Smart City makes a single complex urban entity with three pillars: technological foundation, social foundation and ecological foundation. It’s all three innovative cities in one, **the Urban Trinity of Information/Cyber City, Intelligent/Knowledge City and Ecological/Clean city**, like as:

- I. Digital/ICT/Hi-Tech/Ubiquitous/Mobile/Cyber City (Digital/Information Capital; Innovative Technologies, Intelligent ICT Infrastructure, Multi-Play Telecom Network, ICT spaces/systems/applications, Ubiquitous Computation, Internet of Things, Network-integrated Real Estate, Virtual Lifestyle)
- II. Sustainable/Ecological/Green/Zero-Carbon/Zero-Waste/Eco Friendly/Solar City (Natural Capital; RES Technologies, Green Energy Network, Eco Estate, Green Lifestyle)
- III. Knowledge/Learning/Innovation/Intelligent/Science/Intellectual/LivingLab/Creative/Human/Social City/Noopolis (Intellectual Capital; Social Cohesion, Knowledge Assets, Knowledge Triangles, Health Triangles, Intelligent/Smart Lifestyle)

The fully sustainable city, the Trinity City, is to merge the Cyber/Digital, Natural/Ecological, and Social/Intelligent Spaces. Such a City of the Future is envisioned as a key node of the Smart/Sustainable World with smart communities, buildings, infrastructure, government, intelligence, education, healthcare, public safety, telecom, banking, retail, stimulus, work, traffic, transport, computing, products, food, energy, oil, and water. For the Smart World is all about knowledge society, smart economy, smart people, smart governance, smart transport and ICT, smart environments, smart living and creative working in eco-intelligent buildings, cities, regions, and countries.

Thus, the Smart City is to combine the best features of innovative communities, intelligent cities, digital towns, smart urban areas, green municipalities, or zero energy/ carbon/waste cities.

Emerging as an intelligent sustainable community, it is to be distinguished as:

- o a world-class community of eco-intelligence implementing the most innovative development strategy;
- o an urban ecosystem of sustainable living, well being, and quality of life;
- o a master-planned knowledge ecosystem and innovative business environment, fostering a climate and culture of innovation, creativity, quality lifestyle and modern entrepreneurship, health and well-being;
- o an integration of living/residential, working, commercial, retail, recreating, learning, and public spaces, buildings and facilities;

- a common model/paradigm for globally emerging sustainable communities and smart cities.

The true Smart City is committed to the following Value Propositions:

- Eco-Intelligent Infrastructure
- Sustainable Living, Well Being and Quality of Life
- Ecopolis (smart environment/natural capital and resources, eco-health, safety and security, engineering and sanitation, conservation and protection, landscape integrity, and awareness; re-use, reduce, recycle and recover of resources, materials and energy);
- Smart People, Communities, and Society, Social and Human Capital;
- Future Proof Smart Technologies;
- Network Integrated Township (Smart Connected Communities, Ubiquitous Eco City);
- City Intelligence (Knowledge and Health Triangles, Intelligent Management Urban Platform);
- Environmental Infrastructure, Smart Utilities and Energy Networks;
- Smart Mobility (innovative transportation, FO ICT networks);
- Intelligent Green Lifestyle and QoL Facilities (cultural, health, safety, housing quality, education, touristic, and entertainment);
- Smart Governance (i-services, social, cultural and political cohesion);
- Innovation Economy and Knowledge Industry
- Sustainability Standards;
- Private, Public and Civil Society Partnership; financing schemes: BOT, BOOT, BOO, BLT, DBFO, or DCMF (Design, Build/Construct, Own, Operate, Transfer, Manage, Finance, Lease);
- Intelligent Investment Projects (Impact/Socially Responsible Investment)

Thus the key characteristics of truly smart city is intelligent/knowledge communities of smart people and territorial institutions enabled with the eco-smart urban infrastructure, integrated and controlled by a Single Intelligent City Management Platform, the foundation of the Urban Internet of Systems, Services, Knowledge and Citizens. The Eco-Smart Urban Network is to comprise:

- Environmental Infrastructure: eco-smart water supply systems, waste disposal facilities/treatment systems, pollution control systems and services
- Intelligent Traffic Infrastructure, Networks, Facilities, Systems and Services
- 40-100 GB Intelligent Optical ICT Infrastructure, Networks, Systems and Services
- Social Infrastructure (Knowledge Triangle Networks, Health Triangle Networks)
- Onsite Distributed Energy Networks of Renewable Resources built in the Smart City Eco Estates, Residential and Non-residential.

SMART ECOCITY CHARACTERISTICS

- World class conception, sustainable city strategy, model, design, architecture, planning, construction, technology, service, and life
- Virtual Reality City
- Eco City Development: Security, Sanitation, Eco-Engineering, Conservation and Protection, Landscape Integrity, Eco-Awareness
- 100% renewable energy/Carbon neutral/Green Energy positive city
- Zero waste/Reducing/Reusing/Recycling/Energy Recovery/Disposal/ Waste Management Strategies
- Next Generation FO ICT Network/Services, Renewable Energy Sources, Social Intellectual Capital
- Smart/Intelligent City Environments, Knowledge Enabling Grid, Knowledge/Innovation City
- Health Park of global excellence (World Class Medical Center, Eco Hospital, Rehabilitation Center, Wellness Center, and Assisted Living)
- Education Park & R&D & Innovation & Technology Park & Commerce and Business Parks of global excellence.
- Smart Connected Real Estate with environmental infrastructure and eco-smart buildings
- Green Residential with intelligent home environments
- Integrated wellbeing, experience and lifestyle; top quality of life/work/study supported by smart green urban environments. Living quality lives, meaningful, enjoyed, creative, in virtual, green and intelligent spaces
- Global benchmark of future urban sustainability
- Intelligent Operations Center, Single Service Delivery Platform, Smart City Management Platform, etc.

Smart Eco City Platform: Virtual Reality City/Digital Model/Online Intelligent City/EcoCity Portal/Urban OS/Smart City Cloud Platform

The Virtual/Digital City Smart Model is a complete multidimensional digital representation of a real-life future city, to be operating as an Intelligent Community Operating System, or Urban Intelligent Management Platform, or Digital Ecosystem Smart Environment, or Smart City Cloud Platform.

It will provide a 5D+ digital visualization/simulation/drawing of city terrain, core infrastructure, green energy and utilities networks, facilities, real estate, residential and commercial, soft social infrastructure, intelligent urban environment, and home services:

- A. Entire Urban System (Digital City project, Sky/Cloud City, a greenfield land site, terrain, green space, landscape& gardens, city infrastructure, road networks, renewable energy and utility networks, ICT infrastructure, integrated real estate, smart urban services, sustainable urban planning and design, landscape architecture, urban agriculture, living roofs, ecological planning, smart city design; tools, PWBS, Digital City software, LandXplorer; Consultants, Autodesk)
- B. Smart Eco Homes, Residential (Eco City project, sustainable planning, design and construction, residential units, attached, semi-detached, detached eco homes, BIM models)
- C. Intelligent Eco Estates, nonresidential (Knowledge City project, sustainable planning, design and construction, BIM models)
- D. Innovation Clusters Models (Knowledge/Innovation City project, sustainable planning, design and construction; BIM models)
- E. Smart Social Infrastructure (Knowledge/Innovation City project, sustainable planning, design and construction, architectural and engineering; tools, BIM models)

Online commercial intelligent city platforms and services:

- I. Intelligent Cyber University (Virtual Campus, online graduate education, virtual learning environments, multidisciplinary virtual schools, cyber classes, online graduate courses and postgraduate program; LMS, CMS)
- II. Virtual Residential Eco-Smart Estates
- III. Virtual Innovative Clusters (in Green Energy, BioMedical Technologies, ICT and Telecommunications, Nuclear Technologies, etc.)
- IV. Virtual Non-Residential Eco-Smart Estates (renting virtual spaces for e-commerce smart business)
- V. Virtual City Smart Platform (integrated whole-project model, virtual city portal, citywide digital ecosystem for smart sustainable development)

The Virtual Intelligent City is to simulate, analyze, design, synthesize and visualize the projected new urban development in all its key levels, landscape, roads, integrated infrastructural networks, facilities, campus, health center, innovation centre, cultural center, commercial centre, residential buildings, homes, and all major services. The EcoCity Intelligent/Digital Model is to be developed as a single multidimensional software environment for all project documentation, drawings, plans, specifications, maps, designs, images, detailed infrastructure and building models, aggregating GIS, CAD, BIM, and 5D data (3 D Design + Cost Estimating + Schedule Planning).

Smart Urban Infrastructure Projects [Funding: PPP Investment]

1. Smart Sustainable Development Framework
2. Digital/Smart City Model: Intelligent Optical Telecom Infrastructure;
3. Eco-Sustainable City Model: Environmental Infrastructure and Green Energy Network
4. Knowledge/Intelligent/Innovation City Model: virtual innovation clusters platforms
5. Intelligent Eco City Framework: ND Smart Digital/Virtual Platform

An open Digital City Intelligent Management Platform is to function as an intelligent city operation system to be integrated via sensors networks in the urban space, public infrastructures, buildings, and applications. It will come as a universal interface for multiple platforms and individuals modules for different functions: (1) visiting and learning about the local technology community, (2) collaborative technology intelligence and foresight, (3) technology learning and skills development, (4) innovation communities building, (5) global marketplace for research and technology outcomes, and (6) utilities and energy management and saving.

A SMART ECOCITY REFERENCE PLATFORM: Virtual Model Tools

Five reasons for creating the Cyber City/ Digital/Virtual 5D Model (3D + Time/Schedule Dimension + Cost/Budget Dimension):

1. A combined and computable digital and visual model of Smart Eco City and its communities, its infrastructure, physical and social, its green real estate, and future scenario.
2. A digital platform that can synthesize, analyze, simulate, and communicate the sustainable development from different points of view/points in time.
3. An innovative solution that allows agencies, developers, and design professionals to communicate, collaborate, and deliver the Program in a more effective and engaging and stimulating way.
4. A business tool to better plan, see, sell, and operate the smart eco-development essential for futures high-performance intelligent cities and regions and knowledge economies
5. A single integrated visualization, simulation, control, and management intelligent platform

DIGITAL CITIES, SOFTWARE CITIES, INTERNET CITIES, WEB CITIES, VIRTUAL URBAN ECOSYSTEMS

The types of virtual/digital/software cities on the web, or internet cities, are as different as the architecture and scope of data, information, communication, and service. There are commercial city-portals focusing on business information services, virtual cities of 3D public spaces and buildings, multi-purpose and multi-functional digital cities, or government portals providing public communication platforms, like the Microsoft's Connected Government Framework or the IBM's Intelligent Operations Center for Smart Cities.

Regardless of such diversity, there is a universal model and general platform of digital cities. Some attempts to create common software platforms are referring to standard cloud computing technologies: <http://living-planit.com/default.htm>.

In all, the shared architecture of digital cities may be described by a four level structure (see the Architecture of Intelligent Cities, N. Komminos). The first is the *information storehouse*, a database including all digital content, in any form, texts, images, diagrams, sounds, video, and multimedia. The digital content is usually organized according to the logical patterns, the districts, and the hierarchy of the city. The second is the *applications* level, which structure the digital content and provide online services. A digital city that offers information services, e-market, and e-government, includes at least three applications, which assume the tasks of delivering information, commercial, and governmental services. The third and upper level is *user interface*, which includes all the web pages that users visit in order to get the services provided by the digital city. Driving a user in the different areas of the digital city, the user interface may utilize maps, 3D images, texts, and diagrams. Then, a fourth level is *administration*, a tool crossing the database and the applications, which enables managing the user rights to the applications and the digital content of the database.

This universal architecture of digital cities is composed of three vertical levels (content, applications, and interface) and multiple horizontal applications (functions), depending on the breadth of the digital city services (representation, information, work, leisure, commerce, transactions, etc.) (Fig. 1). The model is generic and by customization may serve any concept of digital city, specialized in site-seeing, e-government or e-work. The structure is independent of the medium on which the city runs. The latter may be the Internet, a municipal network or a metropolitan network made of fiber optic lines or wireless links (Architecture of Intelligent Cities).

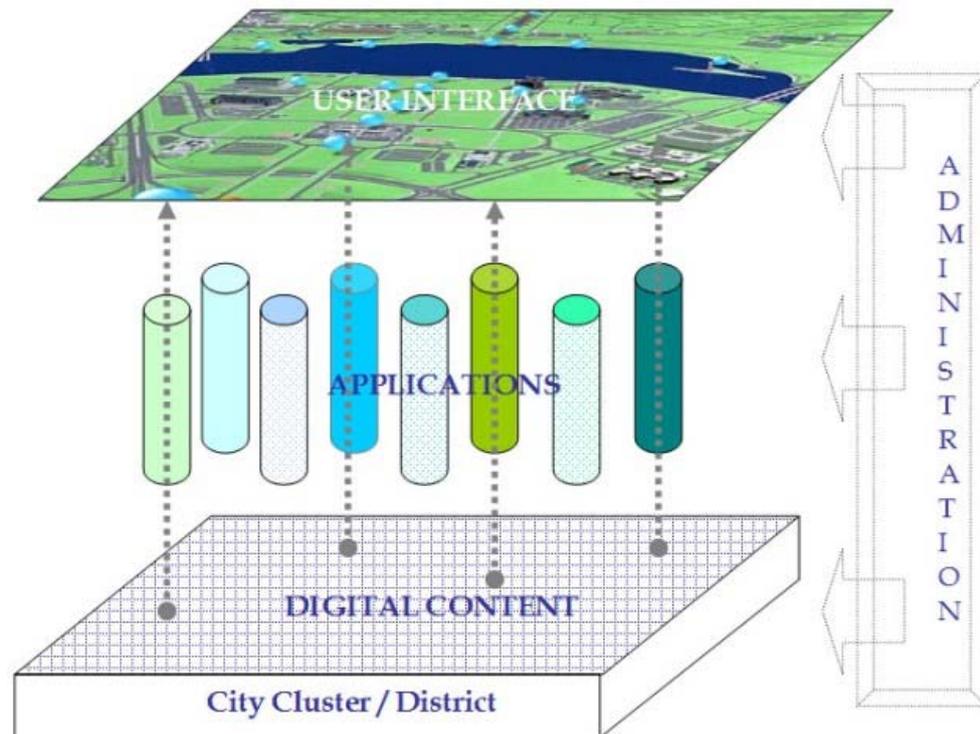


Fig. 1. Digital/Virtual/Software/Web/Internet City Structure (Credit to Nicos Komninos, URENIO)

AN INTELLIGENT CITY MODELING

The concept of ‘intelligent city’ has been evolving over time (N. Komninos). At least four different descriptions of what an intelligent city is can be found in the literature and practice, largely involving innovation, smart growth, or digital community spaces; namely:

- virtual reconstructions of cities, digital representations, simulation cities, or virtual cities.
- digital cities, an urban development based on information and communications technologies.
- urban environments with embedded information and communication technologies creating interactive spaces that bring computation into the physical world. Intelligent cities (or intelligent spaces more generally) refer to physical environments in which information and communication technologies and sensor systems disappear as they become embedded into physical objects and the surroundings in which we live, travel, and work.
- territories that bring innovation systems and ICTs within the same locality, combining the creativity of talented individuals that make up the population of the city, institutions that enhance learning and innovation, and digital innovation spaces facilitating innovation and knowledge management.

Its most close synonyms are “innovation city”, ‘intelligent communities’ and ‘intelligent innovation environments’. For us, intelligent cities and regions are territories with high capacity for learning and innovation, which is built-in the creativity of their population, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge management. The distinctive characteristic of intelligent cities is their increased performance in the field of innovation, because innovation and solving of new problems are distinctive features of intelligence. In this sense, intelligent cities and regions constitute advanced territorial systems of innovation, in which the institutional mechanisms for knowledge creation and application are facilitated by digital spaces and online tools for communication and knowledge management.

Intelligent cities are 3-layer systems of innovation, combining (1) innovative clusters, (2) innovation and technology learning institutions, and (3) digital innovation environments (Fig. 2). Intelligent cities constitute a discrete category of intelligent environments created by the agglomeration of creativities, smaller systems of innovation that operate within cities (technology districts, technology parks, innovation poles, innovative clusters), and digital networks and online services. Their added value is in the ability to bring together three forms of intelligence (human intelligence of the city’s population; collective intelligence of institutions supporting learning and innovation; artificial intelligence of digital networks and online services) and assure higher innovation performance.

Intelligent cities are systems of innovation combining innovative clusters, technology learning institutions, and digital innovation spaces. The platforms enable the creation of digital spaces facilitating five key innovation processes.

The digital dimension of intelligent cities - the concept of intelligent cities as territories that link human, collective and artificial intelligence, with four IT platforms that sustain the knowledge functions of these cities. The platforms facilitate operations in the fields of strategic intelligence, technology dissemination, new product development, and product promotion. These are fundamental innovation processes based on the skills of the population of the cities, the institutions involved in knowledge and innovation creation, and IT tools for communication and learning. The digital city platforms are a fundamental step for designing intelligent communities and cities.

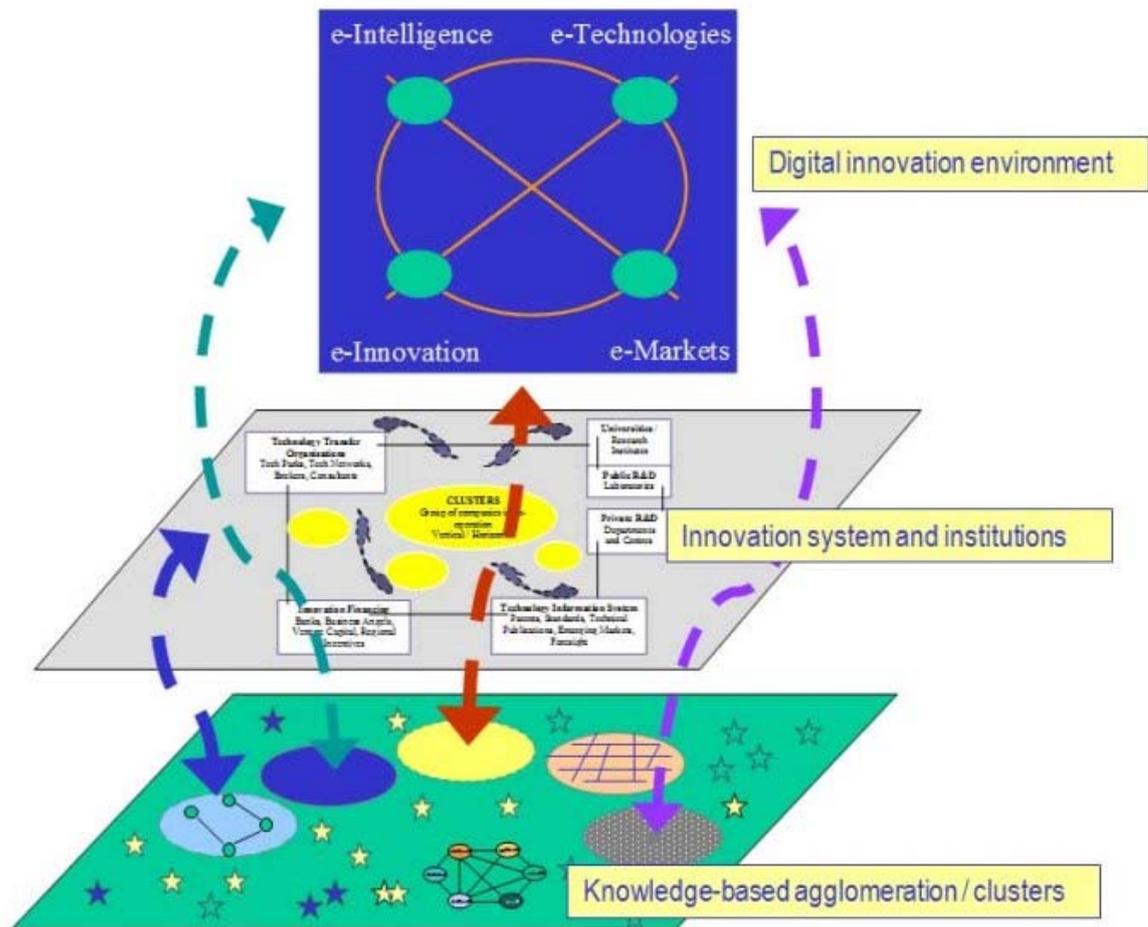


Fig.2. Architecture of Intelligent Cities (Credit to Nicos Komninou, URENIO)

L1: The basic level of an intelligent city is the city's productive clusters, in manufacturing and services. This level gathers the creative class of the city made by knowledgeable and talented people, scientists, artists, entrepreneurs, venture capitalists and other creative people, determining how the workplace is organized and how the city is developing. Proximity in physical space is an important factor that facilitates knowledge cooperation and exchange among producers, suppliers, service providers, and knowledge workers.

L2: A second level is made of institutional mechanisms regulating knowledge flows and co-operation in learning and innovation. This level gathers institutions enhancing innovation: R&D, venture capital funds, technology transfer and training centers, intellectual property, spin-off incubators, technology and marketing consultants. Institutions manage intangible mechanisms of social capital and collective intelligence that guide the matching of individual capabilities and skills, and actualize the complex processes of innovation within the clusters of the city.

L3: The third level is made up by information technology and communication infrastructures, digital tools and spaces for learning and innovation. These technologies create a virtual innovation environment (Fig. 3), based on multimedia tools, expert systems, and interactive technologies, which facilitate market and technology intelligence, technology transfer, spin-off creation, collaborative new product development, and process innovation. This is a working environment operating in close connection with innovative organizations and institutions regulating knowledge and innovation.

The three levels are integrated and work complementary to each other. Within innovative clusters, digital city applications complement knowledge networks and institutional switches regulating innovations. Four functions, which are characteristic of intelligent cities, emerge out of this integration.

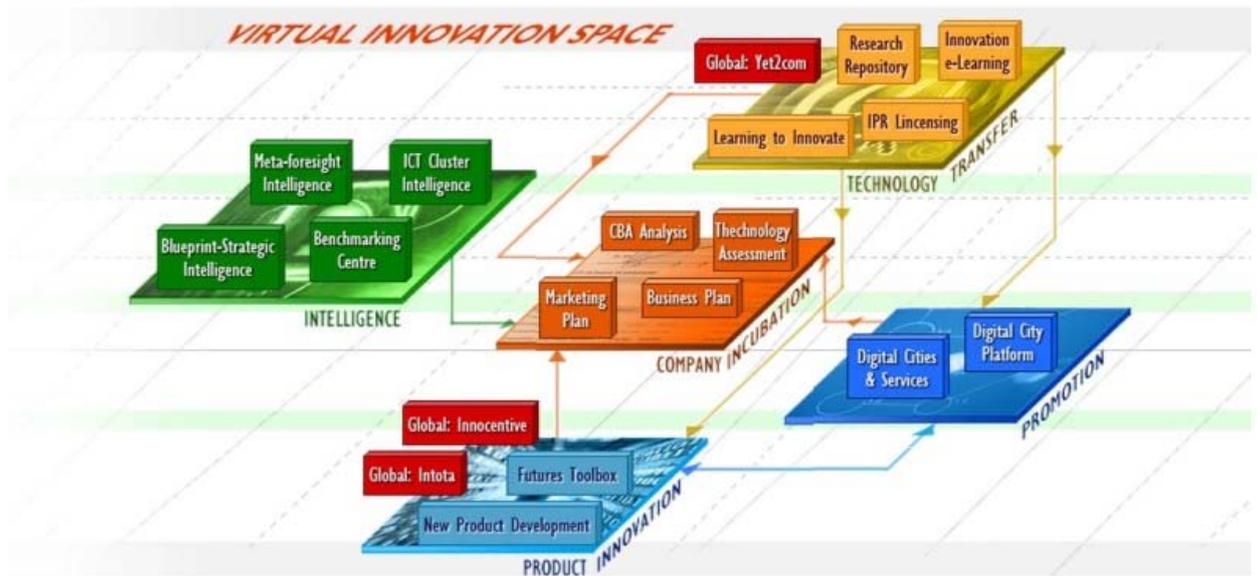


Fig.3. Virtual Innovation Space (Credit to Nicos Komninos, URENIO)

A principal application of the Full Smart City Model is to develop an intelligent city management platform of Federated Intelligent Cloud Computing, a Smart City Environment in the Intelligent Sky, a **Sky City** (see Fig 4.), operating as the intelligent control and command center for the urban internet/web of things, services, knowledge and citizens.

The City in the Sky (an Integration of Intelligent Clouds), virtualizing all the city elements as centrally coordinated functional clouds, from the urban infrastructures clouds to the e-government cloud, is to integrate the latest ICT solutions, like as the Internet of Things, Computing/Web Ontology, Web 3.0, Autonomic/Intelligent Clouds, Sky Computing/Cloud Computing, the Microsoft Azure Application Platform, Autodesk's Digital City solutions, IBM's Intelligent Operations Center for smart cities, and sustainable development solutions.

The Smart Sustainable Community Model implies developing a **smart city management platform as an intelligent operations, command and control center**, combining ontological/semantic engineering, intelligent sky/intercloud computing, intelligent software techniques, GIS, knowledge management tools, and smart/intelligent city solutions, thus enabling the creation of smart cities and communities of different scales across the globe. As an application field, there are considered the island of Cyprus, as well as the New Moscow Federate District (to be proposed as a smart eco city development), to be managed by the Intelligent Country/City Management Platform (Country/City Intelligent Operations Center), integrating the national/urban planning and strategies, smart infrastructures, real estates, technologies, governance mechanisms and other critical services.

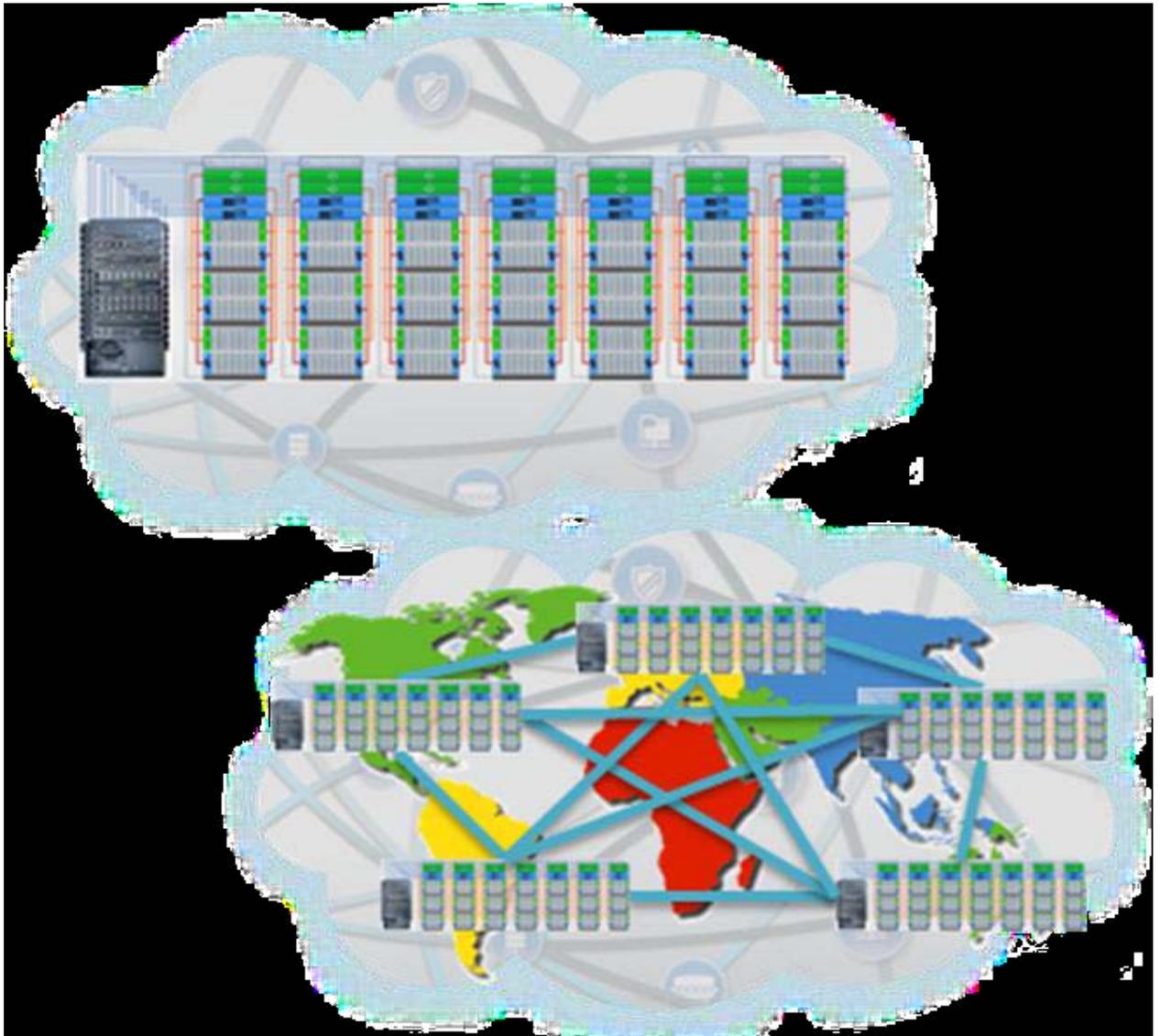


Fig. 4. Federation of Cloud Cities in the Intelligent Sky Computing Platform: an O-Federation of i-cities in the smart clouds with a common ontology and semantics, cloud interoperability, inter-cloud protocols, addressing, naming, identity, trust, presence, messaging, multicast, time domain, application messaging (for the Figure, credit to Cisco Systems)

SMART CITY SYNTHESIS: EU 2020 Strategy, IBM's Smarter Planet and Cisco's Smart + Communities

The Smart Sustainable City concept is in line with the Europe 2020 highlighting as priorities:

- Smart growth: developing an economy based on knowledge and innovation.
- Sustainable growth: promoting a more resource efficient, greener and more competitive economy.
- Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.

In the market world, there are two big IT companies promoting two big ideas, for the same global audience: the IBM's Smarter Planet and the Cisco's Smart + Connected Communities.

Seeing how fast things are going, every big corporation is jumping on the bandwagon. Recently, the big couple have been adjoined by other international corporations as Siemens (Infrastructure & Cities), Microsoft (Digital Cities/Azure Platform/Connected Government Framework), Huawei, Alcatel-Lucent, Intel, Oracle (iGovernment), France Telecom (Orange), etc. (see the corporate reports).

The Cisco's key promoter of intelligent urbanization, Wim Elfrink, is talking about five applications, transportation, energy and utilities, real estate, safety and security, and citizen services (education, government, healthcare, sport and entertainment), to achieve the network-based sustainable communities.

The IBM's CEO, Sam Palmisano, is talking about 3i World, instrumented, interconnected and intelligent, covering whatever you like to be more efficient, sustainable, and intelligent, from Analytics to Work, from Oil/Gas to now a Smarter City.

It's plain that more efficient way is to go with the over-arching initiative of the Smart World, comprising the Smarter World of Smart + Connected Communities, by applying the integrated, holistic model at every level, global, national, regional, urban or local, as with the proof-of-concept pilot project, "Neapolis Smart EcoCity", <http://www.neapolis.com>.

By its very nature, a true sustainable city is a multiple urban entity, having many features, forms, or spaces. As a minimum, it's a triplex city of information, ecology and humans.

- i. From technological prospects, it's a digital city, cyber city, networked city, or digitally smart city, where NG ICT networks, mobile and ubiquitous and cloud computing, 4G+ wireless networks, augmented virtual reality, sensor networks, software agent technologies, etc. are embedded in the physical urban environment.
- ii. From ecological perspectives, it is a clean city, green city, eco city, or ecologically healthy city, where distributed energy networks, renewable energy sources, green technologies, etc. are embedded in the physical urban space.
- iii. From social prospects, it is an intelligent city, social capital city, knowledge city, innovation city, or creative city, where knowledge-intensive activities, intelligent governance and social networks, meaningful public spaces, and knowledge triangle infrastructure are shaping the social city environment.

Full sustainability consists in a synergetic integration and interaction of all urban dimensions, as integrated physical, virtual, natural, social, and institutional spaces. As a result, a unified digital infrastructure, as built into environmental infrastructure or RES networks or eco-buildings, supports all city ecosystems, innovation economy, infrastructure and utilities, governance, and connected communities.

As smart/green/intelligent technologies are shifting to sustainable technologies, so smart/green/intelligent communities, to sustainable communities - districts, towns, cities, metropolises, regions, countries or the entire planet.

Crucial, relying only on any big technology developers hardly decides the principal challenges of sustainable urban development, be it the Huawei's smart city technical concept or Oracle's solutions for smart cities, Smart Processes, Smart Infrastructure, and Smart Innovation for local governments, smartly promoting their business products, services, packages and suites.

However big, they all are merely technology companies with the astute marketing strategy to capitalize and promote accumulated digital capital and knowledge assets, bridging it with the physical capital (infrastructures).

It's not strange that no industrial corporations, however big, has been originated smart cities projects *ab novo*, what is mostly planned by governments, national or local, or some innovative real estate developers.

SMART BRANDING

The smart companies' value is largely based on the intellectual capital. The world's most valuable brand names are already connected with smart business and green industry or social capital investment, like the global world cities are already capitalizing on the best world's skills, talents, and intellectual capital.

The recent statistics show that some Smart Technology and Telecom providers have the brand equity/value exceeding \$ 100 billion. Apple with the i-tablet computing products and services having the brand value about \$ 153 billion, or IBM with the Smarter Planet methodology having the brand value about \$ 101 billion, see [BrandZ Top 100 Most Valuable Global Brands 2011](#). Nowadays, the brand name and equity is becoming of most decisive factor of all assets, as economic resources producing economic benefits and values, tangible and intangible: physical assets as fixed real estate, plants and equipments and current assets as cash and inventory, and nonphysical assets as patents, goodwill, trademarks, software, bonds and stocks.

As far as the **BRAND Equity** is measured as the **MARKET CAPITALIZATION** minus **TANGIBLE ASSETS** and **INTANGIBLE ASSETS** (measurable), the brand equity approximates the market capitalization for real smart legal entities neglecting collecting the physical capital (assets).

In the new Smart Branding Market of smart city products and services, processes and technologies, the following companies are proposed as leading in terms of capabilities and visibility: IBM, Buro Happold, Siemens, GE, Accenture, SAIC, Alstom, Mitsubishi Heavy Industries, ABB, Oracle, Samsung, Cisco, Philips, SAP, HP, Home Depot and Autodesk. They are selected among technology integration companies, utilities, ICT firms, telecommunications carriers, sustainable urban planners, designers, architects, engineers, consultants and institutions: see "[Who's the Leading Smart-City Brand](#)" report. The brand name recognition is today a road to getting a leading position in the emerging global knowledge economy. **The intelligent brand name is a key to success.** Belonging to a family of intangible assets and intellectual property, it amazingly provides enormous real value, measured at many levels: globe, country, industry, firm, product or customer.

The smart branding strongly drives business value and global sales, top-line revenues and bottom-line profits, productivity, costs, quality services, market values, share prices, without having a physical value of equipment, without appearing on balance sheets, and without being the physical assets which one can see or touch or physically measure.

It's plain that the smart branding brings the maximum value than it covers a whole new city or the entire country. Welcome to the intangible/invisible world of knowledge assets, the smart world of cyber and real spaces, the physical world of material entities, the social space of human beings, and the virtual world of software entities.

Greenbang Smart Matrix™–Smart Cities



SMART PROPERTY RE/EVOLUTION: From Real Estate Developers to Smart/Intelligent City Developers and Sustainable Communities Builders

That's most critical, neither technology company, however big or dynamic, alone or in cooperation, is capable to meet the principal challenges of sustainable urban development. IBM with its Smarter Planet business strategy, or Cisco Systems with its the network-based Intelligent Urbanization, or Huawei Technologies, targeting for a Smart City with ultra-fast FO ICT Network and Service Planning, Single Infrastructure, Multi-Industry Integration, attractive ICT applications, knowledge workforce, and fair society. They are merely technology developers, with some singular innovative marketing strategy, but all trying to capitalize and promote accumulated digital capital and knowledge assets, bridging it with the physical world capital (infrastructures). One is tapping the expertise in business analytics, systems management, sensors and security (IBM). Another, in the network routing and switching and (optical) networking equipment and "smart" ICT services (Cisco Systems). The third (Siemens), in industrial and building automation, lighting, power generation technology, water treatment systems, medical technology, communication systems, and computer PLM software, etc.

It's not so surprising that neither technological corporation, nor engineering and industrial group, has managed to originate and implement the overall model of smart cities from the scratch, like the Smart Group is preaching and promoting.

No technology providers, alone or together, has enough knowledge and expertise and capacity to systematically go for a full sustainable city development, a complex public-private-civil society partnership project, involving as many stakeholders as sustainable urban planners & designers, green architects, smart infrastructure planners and engineers, environmental engineers, technology developers, real estate developers, urban economists, and what not. Crucial, the life cycle of any true sustainable city starts from the principal stage, **conception and modeling**, laying the foundation for the whole enterprise, **sustainable urban planning and design**, technological development, construction and implementation, extended with smart, sustainable, and inclusive growth and expansion.

Again, sustainable urban planning encompasses the design of urban environment, environmental infrastructure, green energy systems and smart utilities and ecological buildings, multi-play fiber telecommunications networks, distributed systems of networked computers, servers farms, data centers, or cloud computing, smart public amenities and facilities, knowledge triangle institutions, health triangle facilities, intelligent city services, etc.

Thus, in developing Smart Sustainable City, a big technology developer, or architectural firm, or real estate developer, or ICT integrator, or urban planner, are replaceable contributors. The principal development stage is the

smart city conception and modeling, done by the “smart city modeler”, “intelligent city developer”, or “sustainable real estate developer”, who is in capacity to develop a Smart/Sustainable Community Development Framework, to be deployed as an Intelligent Sustainable Community, local, urban, regional, national, or international (see the Intelligent Sustainable City/Community Green Book: <http://www.eis.com.cy>).

INTELLIGENT NATIONS PROJECTS: The Smart/Sustainable Cyprus

In the emerging Smarter Planet/Intelligent World, nations compete with each other, like enterprises and cities, for investment, resources, minds, talents, a higher international prestige, better global image, and cultural, economic, and political leadership. Nowadays, there are several countries, mostly islands, striving for the status of intelligent nations as a national strategy and government policy; namely:

1. Singapore, Intelligent Nation 2015 (iN2015), 10 years master plan of “an Intelligent Nation, a Global City, powered by Infocomm”, to enable: Innovation, Integration, Internationalisation. To achieve the goals of the masterplan, the Infocomm Development Authority of Singapore (IDA), together with the industry, identified programmes and initiatives categorized under four building blocks: globally competitive infocomm industry; sectorial transformation of the key economic sectors, government and society; ultra-high speed, pervasive, intelligent and trusted infocomm infrastructure; globally competitive infocomm manpower: <http://www.ida.gov.sg/About%20us/20070903145526.aspx>

2. The Smart Island Malta, the National ICT Strategy (the Smart Island strategy of seven streams, the national RTDI strategy; the National Industrial Policy; SmartCity Malta Project of the global knowledge-based township; the next generation ICT environment, a connected society, putting the ‘e’ on everything, a smart and global workforce, reinventing government, e-Business, world leading ICT industry): <https://mitc.gov.mt/page.aspx?pageid=263>

3. Intelligent Taiwan, formulated by the Council for Economic Planning and Development, and involving all ministries. The i-Taiwan is advancing 12 construction projects in transportation (fast network, port-city regeneration, international airport city), industrial innovation (hi-tech industrial clusters, intelligent Taiwan, industrial innovation corridors), urban and rural development (urban and industrial park-regeneration, farm village regeneration), environmental protection (coastal regeneration, green forestation, flood prevention and water management, and sewer construction), as well as intelligent industries (cloud computing). Its five key concepts are: regional development balance, industrial innovation, new urban and regional features, intelligent capital accumulation, and sustainable development. Its key purposes are expanding domestic demand, improving the investment environment, boosting the health of the economy, and upgrading the quality of life. The total investment is about NT\$ 4 trillion: <http://www.cepd.gov.tw/encontent/>

Implementing the Smart World Concept and the EU Strategy for smart, sustainable and inclusive growth, the Smart Group is advancing the Intelligent Nation Projects as a key social priority. The first under the government approval is the Smart/Sustainable Cyprus Program. It relies on the full sustainability model, with a comprehensive and holistic approach to developing a smart and creative nation driven by intelligence, integration and innovation. Such a unique social change of whole country is challenging and historical. Cyprus, as a strategic island in the eastern Mediterranean, is fully able to transform into knowledge-centered nation (land, country, or state) with all the intelligent capabilities and innovation resources. Changing the nation into an intelligent land needs to take into consideration three i-determinants:

- Intelligence (social, human and intellectual capital, intelligent citizens, smart people, smart/knowledgeable communities, the wisdom of population, collective intelligence, smart governance, and digital intelligence);
- Integration (globalization, collaborative innovation networks, the Future Internet, W 3.0, integrated knowledge supra-networks of the research, development, technology, innovation, business, and public sectors of life, internet-based ubiquitous connectivity, integrated fixed and wireless ultra-fast fiber networks, fixed and mobile GIS and GPS applications, intelligent Internet with the internet of things and web of entities, the wisdom web of knowledge, unified learning, research and innovation space);
- Innovation (innovative social policy, knowledge economy, green economy, digital economy, national ICT strategy, smart environment, green technologies, ICT networks, computer network technology, the internet of things, rich multimedia applications, broadband network infrastructure, omnipresent computation, digital knowledge resources and services, everywhere and anytime, coordinated research, science and technology, and business parks, intelligent services, intelligent power grid and network infrastructure, smart electricity/gas/water meters, smart buildings and homes, streets, villages, towns, cities, areas, and countries).

INFORMATION RESOURCES AND CORPORATE REPORTS

SMART WORLD MODELS

1. Abdoullaev, A., 2011, Keynote: **A Smart World: A Development Model for Intelligent Cities.**

The 11th IEEE International Conference on Computer and Information Technology (CIT-2011)

The Smart World is modeled as a Smart Eco Planet of intelligent sustainable communities: countries, regions, cities, towns, villages, districts, and neighborhoods. The Eco-Smart World is about intelligent communities, natural ecosystems, digital economy, intelligent people, smart governance, smart transport and intellectual ICTs, eco-smart living and creative working in intelligent eco-buildings, cities, regions, countries, and global innovation ecosystems.

A real Smart Sustainable City is a unified urban entity with three critical parts/layers/levels/spaces, all planned, developed and managed as its integral elements:

- **Digital/ICT/Hi-Tech/Ubiquitous/Cyber/Digitally Smart and Intelligent City** (Digital/Information Capital; Digital Urban Spaces, Multi-Play Telecom Network, ICT spaces/systems/applications, Sensor Networks, Ubiquitous Computation, Cloud Computing, Network-integrated Real Estate, City OS, Intelligent City Management Platform, Augmented Virtual Reality, Virtual Lifestyle);
- **Sustainable/Ecological/Green/Zero-Carbon/Zero-Waste/Eco Friendly/Solar City** (Natural Capital; Natural Urban Spaces and Ecosystems, Green Energy Network, Real Eco Estate, Ecological buildings, Green Lifestyle);
- **Knowledge/Learning/Innovation/ /Intelligent/Science/Intellectual/LivingLab/Creative/Human City/Noopolis** (Knowledge Capital; Innovation Systems, Meaningful Urban Spaces, Collective Intelligence, Knowledge Triangle/Ecology, Health Triangle, Human Social City, Intelligent/Smart Lifestyle).

A truly smart city is nothing but three innovative cities in one, **the Urban Trinity of Information Cyber City, Intelligent/Knowledge City and Ecological/Clean city. It is essential to draw distinctions between a smart city, as a unified urban entity, and “smart city” technologies, applications, and systems, as well as fragmented “smart city” projects, lacking the overall conception of the smart city project and resulting in the unsustainably over-costly ventures.** The Smart Eco Cities, as globally networked intelligent, innovative ecological urban areas, are key preconditions for the Smart World of Intelligent Communities.

<http://www.cs.ucy.ac.cy/CIT2011/index.php?p=Keynotes>

2. IBM's Smarter Planet. **What is a Smarter Planet.** By smarter we mean the world is becoming instrumented, interconnected and intelligent. The signs of a smarter planet are all around us.

Data is being captured today as never before. It reveals everything from large and systemic patterns—of global markets, workflows, national infrastructures and natural systems—to the location, temperature, security and condition of every item in a global supply chain. At IBM, we want that intelligence to be infused into the systems and processes that make the world work—into things no one would recognize as computers: [cars](#), [appliances](#), [roadways](#), [power grids](#), [clothes](#), even natural systems such as [agriculture](#) and [waterways](#).

[Since 2008](#), we've talked about what it takes to build a smarter planet. We've learned that our companies, our cities and our world are complex systems—indeed, systems of systems. Advancing these systems to be more instrumented, intelligent and interconnected requires a profound shift in management and governance toward far more collaborative approaches. <http://www.ibm.com/smarterplanet/us/en/>

3. Palmisano, S. (2008), **A Smarter Planet: the Next Leadership Agenda.** Consider how much energy we waste, how gridlocked our cities are, how inefficient our supply chains are, how antiquated our health system is, how our planet's water supply is drying out, and, of course, the crisis in our markets.

http://www.ibm.com/ibm/ideasfromibm/us/smarterplanet/20081106/sjp_speech.shtml

4. **Europe 2020.** The EU's growth strategy for the coming decade. In a changing world, we want the EU to become a smart, sustainable and inclusive economy. **Smart growth** means: improving the EU's performance in: education (encouraging people to learn, study and update their skills); research/innovation (creating new products/services that generate growth and jobs and help address social challenges); digital society (using information and communication technologies). **Sustainable growth** means: building a **more competitive low-carbon economy** that makes efficient, sustainable use of resources; **protecting the environment**, reducing emissions and preventing biodiversity loss; capitalising on Europe's leadership in developing **new green technologies** and production methods introducing **efficient smart electricity grids; harnessing EU-scale networks** to give our businesses (especially small manufacturing firms) an additional competitive advantage; **improving the business environment**, in particular for SMEs; **helping consumers** make well-informed choices. **Inclusive growth** means: **a high-employment economy delivering economic, social and territorial cohesion.** Inclusive growth also means: raising Europe's employment

rate – more and better jobs, especially for women, young people and older workers; helping people of all ages anticipate and manage change through investment in skills & training modernising labour markets and welfare systems; ensuring the benefits of growth reach all parts of the EU.

These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion. Concretely, the Union has set five ambitious objectives - on employment, innovation, education, social inclusion and climate/energy - to be reached by 2020. Each Member State has adopted its own national targets in each of these areas. Concrete actions at EU and national levels underpin the strategy (European Union): http://ec.europa.eu/europe2020/index_en.htm

5. **It's a smart world.** Economist, November, 2010. The real and the digital worlds are converging, bringing much greater efficiency and lots of new opportunities. But is it what people want?

WHAT if there were two worlds, the real one and its digital reflection? The real one is strewn with sensors, picking up everything from movement to smell. The digital one, an edifice built of software, takes in all that information and automatically acts on it. If a door opens in the real world, so does its virtual equivalent. If the temperature in the room with the open door falls below a certain level, the digital world automatically turns on the heat.

6. **Central Nervous System for the Earth (CeNSE).** We create the mathematical and physical foundations for the technologies that will form a new information ecosystem, the Central Nervous System for the Earth (CeNSE), consisting of a trillion nanoscale sensors and actuators embedded in the environment and connected via an array of networks with computing systems, software and services to exchange their information among analysis engines, storage systems and end users. A central nervous system for the Earth is to gather information and send it to the “brain” (cloud computing). 1 trillion nanoscale sensors and actuators networks will need 1000 internets. (HP)

SMART/INTELLIGENT CITY MODELS

7. Komninos, N., 2002, **Intelligent Cities: Innovation, knowledge systems and digital spaces**, London and New York, Spon Press

8. Komninos, N., 2006, **The Architecture of Intelligent Cities: Integrating Human, Collective and Artificial Intelligence to enhance knowledge and innovation.** 2nd International Conference on Intelligent Environments, Institution of Engineering and Technology, Athens, 5-6 July 2006

Intelligent communities and cities belong to an emerging movement targeting the creation of environments that improve cognitive skills and abilities to learn and innovate. They represent environments that enable superior cognitive capabilities and creativity to be collectively constructed from combinations of individual cognitive skills and information systems that operate in the physical, institutional, and digital spaces of cities.

9. Abdoullaev, A., 2010, **Neapolis Smart EcoCity: A Development Framework for Sustainable Communities**, ISBN 978-9963-9958-0-6; Cyprus, EU.

A roadmap strategy with the implementation plan for building a smart sustainable city as a model community for wellbeing and quality of life, characterized by Creative Education, Research, Innovation, Productive Entrepreneurship, Intelligent Lifestyle, Smart City Management, and Sustainable Environment.

A master-planned iconic township of the 21st century is trademarked as “Smart Eco City™”, modeled as the paradigm community to live, to work, to learn and to visit. The viability of the holistic conception is validated by converging the most valuable concepts and practices of digital/smart cities, ecological communities, intelligent cities and knowledge clusters.

The “Smart Sustainable City™” makes a unified project of three innovative cities, as three critical layers/levels planned, managed and coordinated as integral multi-projects:

-  **Digital/ICT/Hi-Tech/Ubiquitous/Cyber City** (Multi-Play Telecom Network, ICT spaces/systems/applications, Ubiquitous Computation, Network-integrated Real Estate, Virtual Lifestyle)
-  **Sustainable/Ecological/Green/Zero-Carbon/Zero-Waste/Eco Friendly/Solar City** (Green Energy Network, Real Eco Estate, Green Lifestyle)
-  **Knowledge/Learning/Innovation/ /Intelligent/Science/Intellectual/LivingLab/Creative/Human City/Noopolis** (Knowledge Triangle/Square/Grid/Ecology, Intelligent Management Platform/Smart Lifestyle)

The development stages are defined as the self-sustaining lifecycle: Conception (Modeling, Vision, Mission) > Analysis (Initiation, Preparation; business analysis, financial analysis, stakeholder analysis, project charter, etc.) > Planning and Design (Schematic design, LLD, HLD, Detailed Design; WBS) > Implementation (Execution, Construction, Manufacturing, Production) > Launch and Operation > Monitoring and Control > Closing > Smart Inclusive Growth >...

As a proof the overall concept of the Smart/Intelligent Eco City Development, **Neapolis Smart EcoCity** has been originated as a fully sustainable city model and prototype, which is currently under development, with the building cost of EUR 2, 5 billion, and estimated GDV as exceeding EUR 4 billion.

(EIS Encyclopedic Intelligent Systems Ltd), <http://www.eis.com.cy>

6. Abdoullaev, A., 2011, **Smart EcoCity™ (Intelligent Eco City™)**, ISBN 978-9963-9958-1-3; Cyprus, EU.

The Study set forth a Standard Smart Development Framework for constructing a Sustainable Community of any size and level: local, national, international or global. The Communities of the Future have been modeled as a Smart Sustainable Community™ of different types, scales and levels:

- Sustainable Community,
- Sustainable City, Eco City, Eco-Smart City, Eco-Intelligent City;
- Smart City, Intelligent City
- Smart/Intelligent EcoCity, Smart EcoCity, Smart Eco City, Intelligent EcoCity, Intelligent Eco City, Smart Sustainable City, Intelligent Sustainable City, Smart Green City, Intelligent Green City;
- Smart Sustainable Cyprus;
- Smart Sustainable Russia;
- Intelligent Europe;
- Smart World; Sustainable World; Smart Sustainable World

Thus, basing on a Comprehensive Sustainable Development Framework, general models of Intelligent Europe, Sustainable Russia, Smart Cyprus, as well as Sustainable Cities have been developed.

Another critical innovation, the Study shows how to build a Smart Sustainable City, starting from its conception and modeling, design and planning, construction and implementation, continued with its territorial growth and expansion.

The proposed model of the Sustainable World of smart green communities is to set standards for the Europe 2020 strategic priorities of smart, sustainable, and inclusive growth, as well as for the global industrial initiatives, such as the IBM's Smarter Planet and Cisco's Smart + Connected Communities.

(EIS Encyclopedic Intelligent Systems Ltd), <http://www.eis.com.cy>

10. **Smart + Connected Communities Institute.** Smart+Connected Communities Institute promotes city development and management for economic, social, environmental sustainability – with an intelligent network. Driven by Cisco, the Smart+Connected Communities Institute provides political leaders, urban planners, developers, academic institutions, system integrators and more an online community where they can collaborate and innovate to develop future sustainable cities. **SUSTAINABLE WORLD Initiative: Sustainable World Commission:** <http://www.smartconnectedcommunities.org/message/1797#1797>; **IBM's Smarter Planet & Cisco's Smart + Connected Communities:** <http://www.smartconnectedcommunities.org/message/1670#1670> <http://www.smartconnectedcommunities.org/index.jspa>

11. Hans Schaffers¹, Nicos Komninos, Marc Pallot, Brigitte Trousse, Michael Nilsson, Alvaro Oliveira. **Smart Cities and the Future Internet: Towards Cooperation Frameworks for Open Innovation.** Cities nowadays face complex challenges to meet objectives regarding socio-economic development and quality of life. The concept of “smart cities” is a response to these challenges. This paper explores “smart cities” as environments of open and user-driven innovation for experimenting and validating Future Internet-enabled services. Based on an analysis of the current landscape of smart city pilot programmes, Future Internet experimentally-driven research and projects in the domain of Living Labs, common resources regarding research and innovation can be identified that can be shared in open innovation environments. Effectively sharing these common resources for the purpose of establishing urban and regional innovation ecosystems requires sustainable partnerships and cooperation strategies among the main stakeholders.

12. Juan Andrés Alonso González, Andrea Rossi, 2011. **New Trends for Smart Cities.** The purpose of this document is to analyze trends and identify the most representative and promising technologies and firms' solutions around the concept of Smart Cities at a global level. It has been divided in different sections that include, among other information, a definition of what a Smart City is, an overview on currently running smart Research, Development & Innovation (R&D&I) projects, and technological solutions offered by various ICT players. A Smart City is defined as a public administration or authorities that delivers (or aims to) a set of new generation services and infrastructure, based on information and communication technologies. Defining 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. Smart City services and infrastructures as well entail the characteristics of engaging and interacting with the citizens that made use of them. Another central element is the adaptive nature of services, ICT systems, infrastructures, buildings that comprehends the Smart City concept. (EU CIP Framework Programme)

13. Andrea Caragliu, Chiara Del Bo, Peter Nijkamp. **Smart cities in Europe.** Urban performance currently depends not only on the city's endowment of hard infrastructure ('physical capital'), but also, and increasingly so, on the availability and quality of knowledge communication and social infrastructure ('human and social capital'). The latter form of capital is decisive for urban competitiveness. Against this background, the concept of the 'smart city' has recently been introduced as a strategic device to encompass modern urban production factors in a common framework and, in particular, to highlight the importance of Information and Communication Technologies (ICTs) in the last 20 years for enhancing the competitive profile of a city. The present paper aims to shed light on the often elusive definition of the concept of the 'smart city'. We provide a focused and operational definition of this construct and present consistent evidence on the geography of smart cities in the EU27. Our statistical and graphical analyses exploit in depth, for the first time to our knowledge, the most recent version of the Urban Audit data set in order to analyze the factors determining the performance of smart cities. We find that the presence of a creative class, the quality of and dedicated attention to the urban environment, the level of education, multimodal accessibility, and the use of ICTs for public administration are all positively correlated with urban wealth. This result prompts the formulation of a new strategic agenda for smart cities in Europe, in order to achieve sustainable urban development and a better urban landscape.

14. **Knowledge Cities for Future Generations.** The 4th Knowledge Cities World Summit (KCWS 2011). The era of knowledge economy, globalization and technological advancements have been influencing and transforming our cities, societies and lifestyles. In recent years, the trio of 'knowledge economy, globalization and technology' have also had an enormously significant effect on the way we generate, attain and spread knowledge not only in the professional circles that mostly impact adult populations, but also in the social circles that impact our children and youth as well as adults. For that reason, this year's Summit particularly focuses on the theme of 'Knowledge Cities for Future Generations'. As it appears in our summit logo – children's building blocks composing the ancient 'Tree of Knowledge' – we believe that on the one hand, knowledge can be generated and then used for building a sustainable future for our children, and on the other, it can also be created by the involvement of our children.

CORPORATE REPORTS ON SMART CITIES

15. **Smart + Connected Communities: Changing a City, a Country, the World.** "Cisco Smart + Connected Communities uses intelligent networking capabilities to weave together people, services, community assets, and information into a single pervasive solution. "Smart + Connected" acknowledges the essential role of the network as the platform to help transform physical communities to connected communities. It also encapsulates a new way of thinking about how communities are designed, built, managed, and renewed to achieve social, economic, and environmental sustainability. Cisco's Smart + Connected Communities helps transform physical communities into connected communities that can help: Realize sustainable economic growth; Enable environmental sustainability through resource management and operational efficiencies; Enhance quality of life.

Smart + Connected Communities provide "Community + Connect" experience for the constituents (residents and business) as well as a "Community + Exchange" for those who manage the community. We understand how important it is for governments and their private sector partners to ensure a thriving, safe community where constituents are free to live, work, learn, and play. Constituents of Smart + Connected Communities have access to information and services that enrich their lives, with solutions for their home, schools, transportation, and more. We call this the "Community + Connect" experience. We understand how important it is for governments and their private sector partners to foster a thriving, safe community where constituents are free to live, work, learn, and play. Cisco has created solutions that can help with the planning, and day-to-day operations and management of a community. We refer to this as "Community + Exchange" (Cisco's Systems).
http://www.cisco.com/web/strategy/smart_connected_communities.html

16. **Building and Managing an Intelligent City.** How new strategies, technologies, open platforms and effective governance can help create cities that are sustainable and attractive to ongoing development. A city capable of becoming both environmentally sustainable and attractive to citizens and businesses requires a new kind of intelligent infrastructure—an innovative, open platform based on smart technologies that can help forward-looking cities more predictably integrate a complex suite of services cost-effectively, at pace and at scale. Accenture believes that the cities that will thrive in this era are what we call "Intelligent Cities"—those capable of achieving and maintaining two important goals simultaneously: (1) reducing the negative impact of people and businesses on the environment, and running government and services in a sustainable fashion; and (2) creating an attractive economic and social environment for growth in which citizens, companies and government live, work and interact. The two goals are closely interconnected, since it is in part the ability of a city to be environmentally safe that creates a large portion of the city's attractiveness. (Accenture)

17. **Making Cities Smart and Sustainable.** The success of smart city initiatives will require the creative application of technology coupled with novel public policy initiatives. It demands levels of collaboration among private and public institutions far deeper than any seen to date. It also requires the extensive and creative application of innova-

tion in terms of technology, public policy, finance, and governance. Smart cities by definition will involve strong public-private partnerships, engaging the active participation of governments (regional and local), private companies, educational and research institutions, entrepreneurs, and civic organizations. There is a tremendous opportunity before us, if we act smartly (and quickly). Urbanization cannot continue on its current path. The smart city vision offers an opportunity to chart a more sustainable course and to potentially eliminate some of the inequalities in broadband access that exist today. This is the right time to fashion a more sustainable, inclusive, and economically vibrant approach to urban growth. Let us take advantage of it. ([Alcatel-Lucent](#)).

18. **Smart Home, Smart City.** Smart City: ICT to enable sustainable behavior. As a "fifth" utility, ICT can enable increased efficiency and flexibility to use new resources. ICT has to come down from the cloud to where resources are used.



With its "Complete mobility" solutions, Siemens has answers to the challenges of growing global population, urbanization, climate change and resource conservation. To ensure mobility in the future, we need closely networked transport and information systems. Whether transport takes place within urban centers or in cities and countries – the multiple challenges can only be mastered if all transport modes are sensibly coordinated and function smoothly. To meet these needs, Siemens offers integrated mobility solutions that ensure safe, economical and environmentally compatible passenger and freight transport. Siemens has all the necessary experience and expertise for the job –ranging from operating systems for rail and tram systems, rail electrification systems, rolling stock for mass transit, regional and long-distance rail lines, to airport logistics and postal automation systems.

([Siemens AG](#)).

SIEMENS



19. **Smart Cities:** true icons of the 21st century. Throughout the world real estate is going through a major transformation. New cities are being created where the network and services running through them are integral to the design and day to day use. Technology will improve life for the office worker and resident alike, enhance building performance and conserve energy. The Orange vision of the Smart City is an environment designed to attract knowledge and talent from around the world and to spur innovation and creativity. The goal of the smart city is to promote education, art, science, medicine, industry, environment conservation, transportation, social communications and public administration to enhance urban life. In Smart Cities people will move around, learn, consume and interact through the use of advanced technologies that have a social dimension, are location-aware, mobile and reactive. Smart Cities are emerging partly because the oil wells that are funding the buzzing Middle East industry are not bottomless: governments in the Gulf are looking for new wealth generated from commerce and tourism to pay back their investment in the new smart built environment. It has become clear to developers and investors that technology can be a key differentiator to put clear blue water between them and their competitors. The

truly Smart City is not just a dream: the technology already exists. The challenge is to pull it all together into a unified, easily-managed environment. Cutting-edge engineering projects like Dubai's Palm Islands with its artificial islands created from sand sprayed into the sea won't stay unique for long. A great view or a prime site helps, but in a building boom that has brought unprecedented competition for landlords and property developers, there is one other essential for attracting new business: access to broadband services, on every floor of every building, in homes and offices, shopping malls and civic centers. Now real estate investors have a new option. In addition to selling units and facilities within the real estate campus, they can also deliver the converged broadband telecommunications services as the 4th utility (after electricity, gas and water) and gain revenue from the services occupiers want and they can enjoy a higher return on their investment and achieve higher sale prices for their properties. In the Smart City built-in broadband is as important as the roads, supporting entertainment, information and business communications. A Smart City requires a high capacity backbone network to support future demand and fiber terminated on each floor of every building so that whenever and wherever services are needed they can be simply and quickly activated. Using IP technology a fiber network will carry information systems to facilitate the automation, centralization and remote monitoring of essential building services, making these cities easier, cheaper and more energy efficient. Additional services can then be accessed without digging up roads or rewiring. Fiber is just the foundation for a range of advanced services that can be layered over the top. Customers of all types, including residents, facilities managers, retailers, corporations, small and medium businesses and hoteliers can share the same single converged IP infrastructure supporting video, voice and data services for different terminals over mobile and fixed line access technologies across an entire development. ([France Telecom, Orange](#))

20. Is Your City Smart Enough? Digitally enabled cities and societies will enhance economic, social, and environmental sustainability in the urban century. 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 CO2 outputs in response to global climate change. However, some "smart" and "intelligent" initiatives will no doubt turn out to be neither. Ovum prefers to use the more value-neutral term "digital." We see two broad streams of digital enablers in cities. The first, digital-city strategies, is the formal/inside-out projects which provide new ways for public authorities and developers to architect and build more efficient infrastructure and services. Digital-city strategies include such things as IP network infrastructure, e-government/gov2.0 services, and the digitization of processes and systems in urban planning, transport, healthcare, education, utilities, and buildings. The second, digital-society initiatives, are more emergent/outside-in. They stimulate self-help and co-production behaviors in the community, strengthen social capital, and engender digital inclusion. These complement public services, but also hold them to account. Digital-society initiatives include such things as: urban action forums (www.greatcities.org), service interfaces (www.fixmystreet.com), hyper-local websites (www.everyblock.com), support networks (www.tyze.com), volunteering networks (www.volunteerhq.org), collective action forums (www.pledgebank.com), carpooling networks (www.zimride.com), social innovation incubators (www.mysociety.org), digital divide programs (www.digitaldivide.org), and the use of social network platforms, such as Facebook, to form communities and mobilize local action. Together, formal digital-city and emergent digital-society initiatives offer the prospect of making cities more livable and sustainable even as they become more densely populated. ([Ovum/Datamonitor Group](#))

21. Brilliant life powered by Smart City. A Smart City efficiently handles the information boom and creates value across many sectors. Based on a combination of virtual and physical infrastructure and intelligent functions powered by network and IT technologies, Smart City offers a perfect lifestyle choice for individual users. 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. A Smart City is purported to be the fourth in size and importance when it comes to infrastructure after water, electricity and natural gas. The availability of information in a Smart City represents an important standard that measures a city or even a country's ICT level, international competitiveness and influence. ([Huawei](#))

22. Smart Cities. Municipal Networking, Communications, Traffic/Transportation, and Energy
Many municipalities are exploring the Smart City concept. They may be installing municipal wireless networks; implementing e-government initiatives by providing access to city departments and initiatives through web sites; integrating public transportation with Intelligent Transportation Systems; or developing ways to cut their carbon footprints and reduce the amount of recyclables that are consigned to the trash heap. This study clarifies the meaning of the term "Smart City" through an examination of more than 50 actual Smart City projects around the world. It also provides insights and data from a range of ABI Research studies that cover many of the technologies that can be used to make a municipality and its various agents more communicative and responsive to its citizenry, while allowing its transportation and other infrastructures to use energy more efficiently and cost-effectively. ([ABI Research](#))

23. **Smart Cities.** Intelligent Information and Communications Technology Infrastructure in the Government, Buildings, Transport, and Utility Domains. For the first time in human history, more people live in cities than in rural areas and in the next 20 years the urban population will grow from 3.5 billion to 5.0 billion people. The social, economic, environmental, and engineering challenges of this transformation will shape the 21st century. The lives of the people living in those cities can be improved – and the impact of this growth on the environment reduced – by the use of “smart” technologies that can improve the efficiency and effectiveness of urban systems. The smart city can be defined as the integration of technology into a strategic approach to sustainability, citizen well-being, and economic development. While there are many innovative pilot projects and small-scale developments that are looking at the smart city from a holistic perspective, there are no examples yet of a smart city that supports hundreds of thousands, never mind millions, of people. The smart city offers a coherent vision for bringing together innovative solutions that address the issues facing the modern city, but there are many challenges still to be faced. If the smart city is to truly become a blueprint for urban development, then a number of technical, financial, and political hurdles will need to be met. ([Pike Research](#)).

24. **The Smart Solutions for Cities.** Smart cities are not simply those that deploy ICT. They combine new technology with smart new ways of thinking about technologies’ role in organisation, design and planning. Arup recommends that city leaders, as they plan smart city initiatives, envision ways that technology can create new urban user experiences; think about the smart city as a holistic system; and consider ways that new systems can result in positive behavioral change. A smart city is one that uses technology to transform its basic infrastructure and optimise energy and resource usage. Arup specialists recommend a smart city development strategy that rests on three interlinked components: leadership, urban informatics, and systems architecture ([Arup UrbanLife](#)).

25. Rosabeth Moss Kanter, Stanley S. Litow, 2009, **Informed and Interconnected: A Manifesto for Smarter Cities.** The need for a fresh approach to U.S. communities is more urgent than ever because of the biggest global economic crisis since the Great Depression. Through examination of the barriers to solving urban problems (and the ways they reinforce each other), this paper offers a new approach to community transformation which calls for leaders to use technology to inform and connect people. We need to convert the social safety net into a social safety network through the creation of smarter communities that are information-rich, interconnected, and able to provide opportunities to all citizens. Realization of the vision requires leaders to invest in the tools, guide their use, and pave the way for transformation. Perhaps the urgency of the current economic crisis can provide the impetus to overcome resistance to change and turn problems into an opportunity to reduce costs, improve services to communities, and make our cities smarter. ([Harvard Business School](#)).

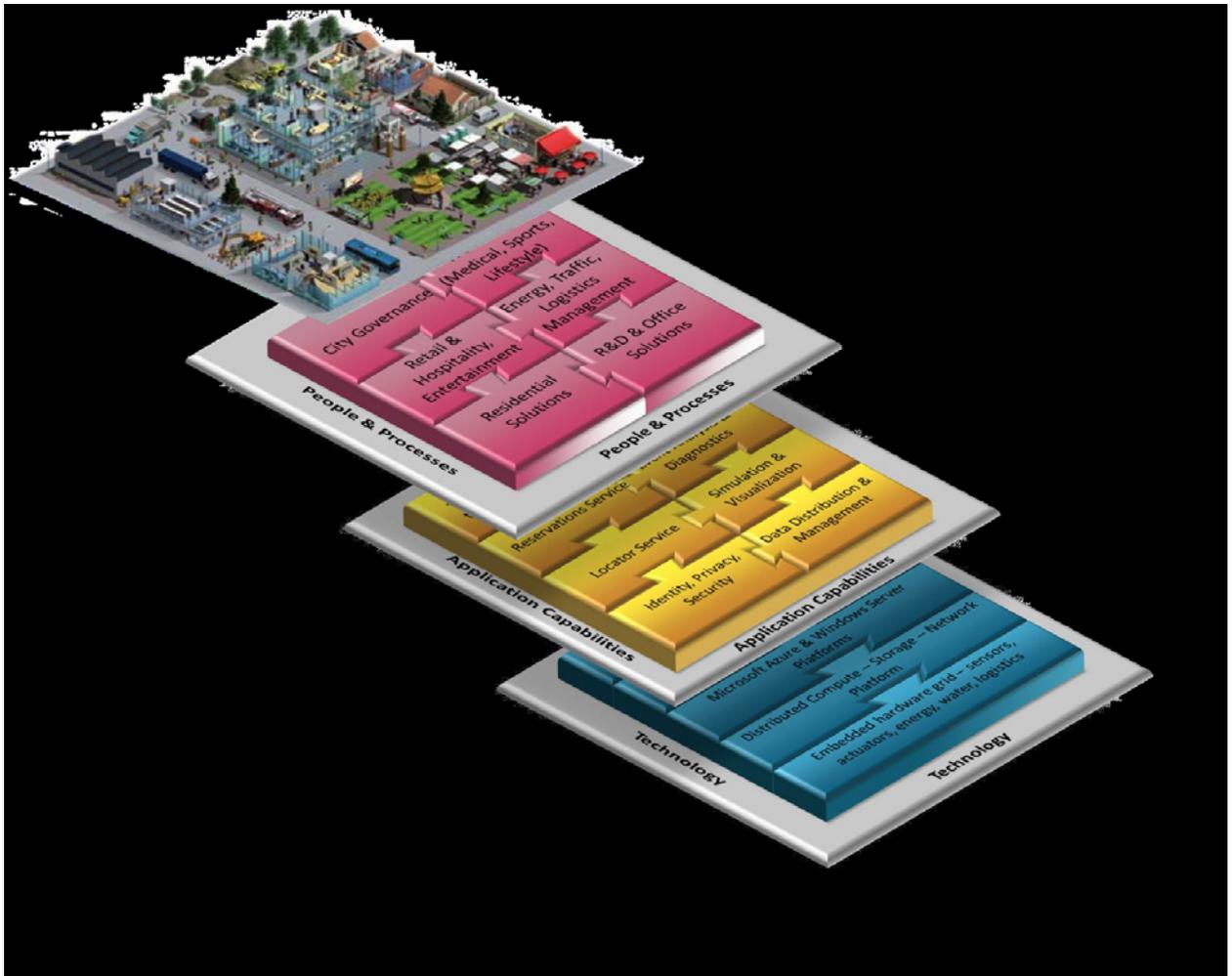
26. **Smart Mobile Cities: Opportunities for Mobile Operators to Deliver Intelligent Cities.** No agreed definition of an intelligent or smart city exists, but they should provide 1) enhanced information flow to citizens and service providers, 2) combine disparate data sets to offer productivity insights, 3) maximize economies of scale across multiple infrastructure layers through a common service delivery platform (UOS), and 4) use innovative technology and innovation to strive to go beyond economic targets, to deliver sustainable, quality of life improvements for its citizens, its industry and the local environment. The report argues that mobile/telecom operators have a fundamental role to play in the emerging Intelligent City multibillion dollar Value Chain, with three layers of opportunity: communications infrastructure, enabling services and full service delivery. As owners of the infrastructure, they are well placed to: (1) Deliver end-to-end services direct to consumers. (2) Orchestrate the disparate ecosystems providing all the services. (3) Provide the technology platform from which these future services can be delivered. Smart city infrastructures may be most compelling in developing cities where no legacy infrastructure exists. Three city archetypes need to be considered: New build cities. Examples are Masdar in Abu Dhabi and Songdo in Korea; Developed market cities. The primary driver here is the need to adopt green energy practices to protect energy reserves; Developing market cities. The primary challenge is urban density and traffic congestion caused by rapid urbanization. It identifies six key opportunities for mobile operators: Intelligent energy, a mobile service to help consumers manage consumption; Mobile payments and ticketing, a mobile payment platform using near-field communication; Analytics and commercial insight; Management and operational analytics platform to provide insight into the city environment; Citizen travel optimization; En route-optimization tool to help citizens identify the fastest, cheapest and most carbon-friendly method of urban travel; Wireless fleet management. Intelligent fleet logistics; mobile tracking and routing via embedded telematics; Remote healthcare; Remote monitoring of patients and automation of health care field workers. ([GSM Association, Accenture](#))

27. **Building Sustainable Cities. Cities in the Cloud.** (Living PlanIT).

In order to demonstrate technological innovation at urban scale Living PlanIT will soon break ground at a 1,700 hectare (4,000 acre) Greenfield site in the municipality of Paredes outside Porto, Portugal. This is the initial phase in the construction of the first of a new generation of intelligent cities – PlanIT Valley.

At the core of Living PlanIT's approach is an integrated platform for managing city operations. The high-level convergence of information and control systems with the fabric of buildings, infrastructure, places and mobility is critical to being able to respond holistically to the challenges posed by urbanization and associated issues of

environmental sustainability. The convergence of manufacturing processes and enabling technologies is delivered through Living PlanIT and Cisco's ecosystem of partners. Living PlanIT has developed several strategic and patented platforms. This requires but is not limited to the following: Convergence of manufacturing technologies in construction; Convergence of Information Communications Technology (ICT) into the construction design; Convergence of Utility and Telecommunications infrastructures. <http://living-planit.com/default.htm>



SUPPLEMENT: SMART WORLD/CITIES ENABLING TECHNOLOGIES

ICT INNOVATION for Smart Cities

CITY SERVICES, Safety & Security/ Emergency Response/Technology Enablers: Integrated Operations Center; Public Transport Optimization; Mobility; Unified Communications (Voice, Video and Data)

HEALTH Technology Enablers: Telehealth (monitoring equipment in the home); Telecare via video conferencing; Mobile clinical assistance and applications for patients to monitor activity, heart rate, etc

HOME Technology Enablers: Home area network; Smart Meters; Secure building management; In-home displays

SPORTS AND LEISURE Technology Enablers: Ticketing, travel & accommodation; Security, surveillance and risk control; Event administration; Media & communications; Stadium management

EDUCATION Technology Enablers: Connected learning; Online libraries; Unified Collaboration; Video Conferencing for tutorials and homework

TRANSPORT Technology Enablers: Supply Chain & Logistics Optimization; Private Transport Optimization; Virtual Conferencing & Telecommuting; Efficient Vehicles (PHEV, EV); Traffic Flow & Optimization

BUILDING Technology Enablers: Energy Management Systems For Buildings; Smart Lighting (Automation); Intelligent Building Design; Demand Side Working & Energy Box (Smart Grid)

[Delivering Next-Generation Citizen Services: Assessing the Environmental, Social and Economic Impact of Intelligent X on Future Cities and Communities, IDC & Cisco]

COMPUTER AND INFORMATION TECHNOLOGY: STRATEGIC COMPUTING TECHNOLOGIES (IEEE)

CIT 2011: <http://www.cs.ucy.ac.cy/CIT2011/>

- Computer and System Architecture
- High Performance Computing
- Utility Computing
- Cloud Computing
- Ubiquitous Computing
- Software Engineering/Computer Programming/Application Software/Programming Languages
- Computer Networks (Internet/Web + Internet of Things = The Smart World)
- Telecommunications (MultiPlay Telecommunications Networks, Wireline and Wireless)
- Artificial Intelligence and Multi-Agent Systems
- Computer Graphics/Image Processing
- Information Visualization
- Information Security/Computer Security
- Management of Data and Database Systems
- New Web Technology and Applications
- IT in e-Health, e-Business, e-Learning, e-Government
- (Business Computing: CAD, CRM, Data Warehouse, DSS, GIS, Utility Computing)
- (Human-Computer Interaction)
- (INTERNET OF THINGS)
- Web 2.0. Social Computing Platform (Facebook, Twitter, LinkedIn, MySpace, and Orkut)
- Advanced Data Analytics and Business Intelligence
- I-Government, i-Health, i-Business, i-Learning, i-Services, etc
- Ontological Engineering (Semantic Web and Knowledge Technologies)

ICT CLUSTERS FORESIGHT (RUSSIA, Skolkovo Innovation Center; W3C, IEEE, ISO, IETF)
<http://www.i-gorod.com/en/it/>

- New generation of multimedia search engines
- Recognition and processing of images, video and audio
- Analytical Software
- Mobile applications
- Embedded Control Systems
- WebX.0
- Complex engineering solutions
- New technology for data transfer and storage
- Cloud computing
- Green IT
- Software for the financial and banking sectors
- IT Security
- IT in medicine and health care
- Wireless sensor networks
- IT in education
- (INTERNET OF THINGS)

Ubiquitous Intelligence and Computing: - Building Smart Worlds in Real and Cyber Spaces

1. Ubiquitous Intelligent/Smart Systems

- * Sensor, Ad Hoc, Mesh P2P Networks
- * Social Networking and Computing
- * Knowledge Representation and Ontology
- * Wearable, Personal and Body Area Systems
- * Middleware and Intelligent Platforms

- * Intelligent Services and Architectures
- * Agents, Swarm and Context-aware Systems
- * Nature-inspired Intelligent Systems

2. Ubiquitous Intelligent/Smart Environments

- * Smart Room, Home, Office, Laboratory
- * Smart Shop, Hospital, Campus, City, etc.
- * Smart Vehicle, Road, Traffic Transportation
- * Healthcare and Elder/Child Care Services
- * Pervasive/Ubiquitous Media and Services
- * Pervasive Learning, Games, Entertainment
- * Other Intelligent/Smart Applications

3. Ubiquitous Intelligent/Smart Objects

- * Electronic Labels, Cards, E-Tags and RFID
- * Embedded Chips, Sensors, Actuators
- * MEMS, NEMS, Micro Biometric Devices
- * Smart Appliances and Wearable Devices
- * Material, Textile, Cloth, Furniture, etc.
- * Embedded Software and Agents
- * Interaction to Smart Objects/Devices
- * Smart Object OS and Programming

4. Personal/Social/Physical Aspects

- * Real/Cyber World Modeling and Semantics
- * User/Object Identity and Activity Recognition
- * Adaptive User Interfaces and Tools
- * Security, Privacy, Safety and Legal Issues
- * Emotional, Ethical and Psychological Factors
- * Implication Impact of Ubiquitous Intelligence
- * Relations between Real and Cyber Worlds

UIC 2010 (<http://www.nwpu.edu.cn/uic2010/>)

GREEN INNOVATION: ENVIRONMENTAL/ECOLOGICAL/GREEN/CLEAN TECHNOLOGIES (Cleantech, Greentech, Envirotech for Transport, Electricity, Heating, and Cooling)

Global and Environmental Technologies/Engineering; Renewable Energy Technologies: (Bioenergy (Biomass, Biofuel, Biogas), Solar Power, Geothermal, Wind Power, Ocean (Wave/Tidal) Power, Hydropower); Carbon Capture and Storage Technologies, Distributed Renewable Management (Smart Grids, Energy-Efficient Systems). ENERGY Technology Enablers: T&D Network Management (Smart Grid); Smart Metering; Intelligent Power Generation; Renewable Energy Management.

GREEN ECONOMICS Solutions: Green Buildings, Green Products and Materials,

RES, Clean Transportation, Water Management, Waste Management; Land Management (Sustainable Landscaping, Organic Agriculture, Habitat Conservation, Urban Forestry and Parks, Soil Stabilization)

SOCIAL INNOVATION: SOCIAL/POLITICAL TECHNOLOGIES (Smart Public Policy, Knowledge Society Strategy, Education Policy, Innovation Strategy, Economic, Social, Environmental and Technological Sustainability/ National, Regional and Local Social Policy, Future-Oriented Strategy, Sustainable Development Strategy, Knowledge Economy, Smart Cities Strategies, Smart Development Comprehensive Planning, Sustainable (Regional and Urban) Development)

The Four Pillars of The Knowledge Economy (the World Bank, <http://www.worldbank.org/>):

Education & Training

An educated and skilled population is needed to create, share and use knowledge.

Information Infrastructure

A dynamic information infrastructure-ranging from radio to the internet-is required to facilitate the effective communication, dissemination and processing of information.

Economic Incentive & Institutional Regime

A regulatory and economic environment that enables the free flow of knowledge, supports investment in Information and Communications Technology (ICT), and encourages entrepreneurship is central to the knowledge economy.

Innovation Systems

A network of research centers, universities, think tanks, private enterprises and community groups is necessary to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge.

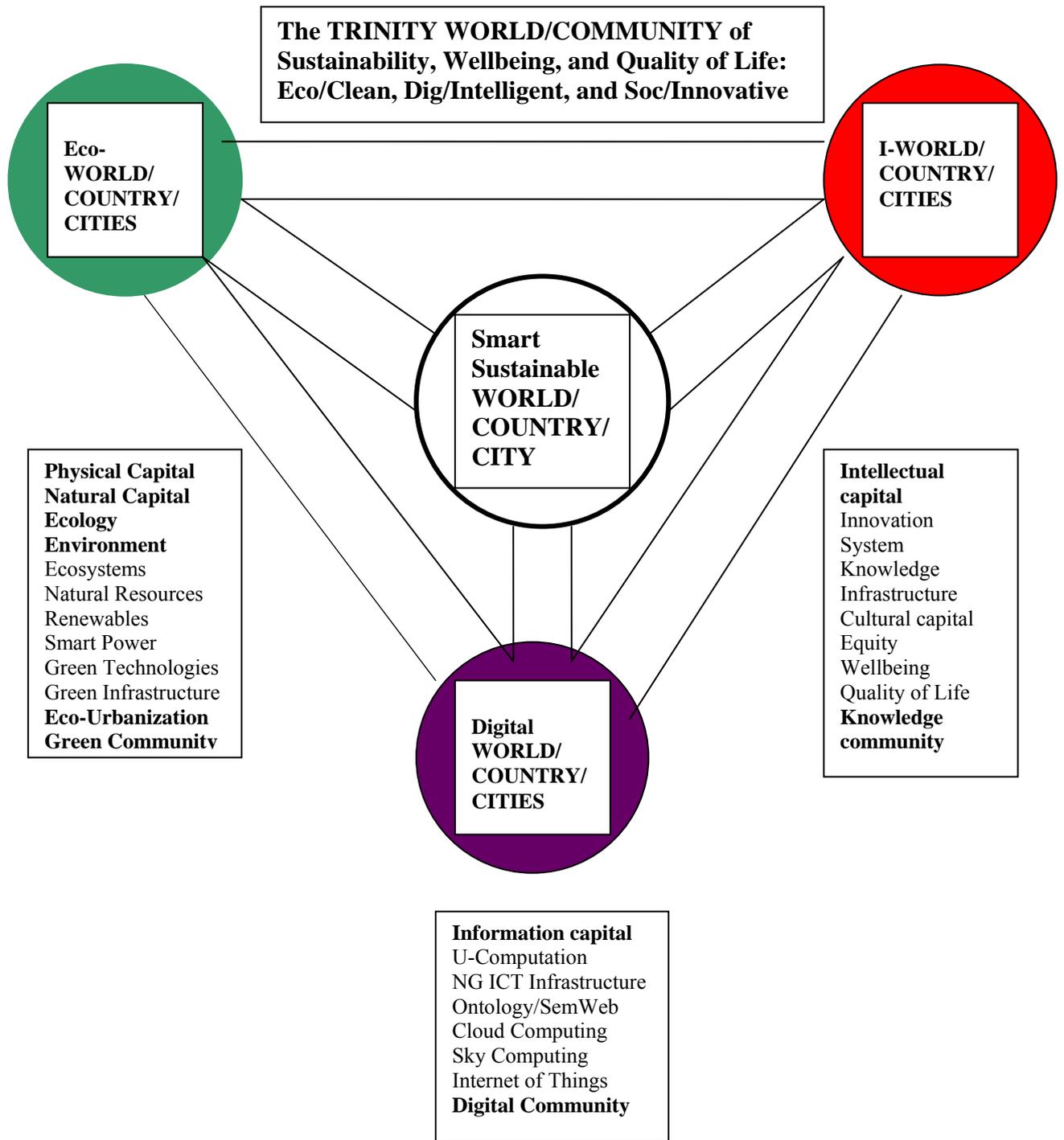


Fig. 5. The World Trinity Diagram™

ABOUT US: The Smart Group

The Smart Sustainable Community Int. Group (**the Smart Group**) comprises prime experts, specialists and investment advisors from different parts of the world, Australia, Malaysia, Russia, EU, India, and USA. The Smart Group includes the pioneer of intelligent cities and innovation ecosystems, the groundbreaker of real smart cities, intelligent/smart eco cities™, selected experts in ontological/intelligent engineering and sustainable urban planning and informatics, and the smart/intelligent investment advisory team.

Together with its Russian sister company, Энциклопедические Интеллектуальные Системы (ЭИС ООО, Moscow, Russia), EIS Encyclopedic Intelligent Systems Ltd (EU, Cyprus) is a leading member of the Smart Group, being among the first innovative companies enabling full sustainable communities and innovation environments of various sizes and scales: local, urban, regional, national, international and transnational.

The Smart Group is singular on the emerging smart cities global market by offering integrated, holistic models of innovation national ecosystems, digital cities, cyber cities, intelligent cities, and green cities as smart sustainable communities, where new solutions, social spaces, collective intelligence, and innovative technologies are developed, tested and embedded.

Creating the Smart Sustainable Community Standard Model, the Group advances the Smart/Sustainable World Concept integrating such global industrial initiatives as the IBM's Smarter Planet (computer technology, software, services, business intelligence and data analytics), Cisco's Smart + Sustainable Communities (networking and communications technologies), Huawei's smart cities (telecom networks), Siemens's smart cities (industry, energy, healthcare), or Microsoft's smart cities.

The Smart Group is unique in providing two types of complete services: i. Full Sustainability Smart Community (City, Region, or Country) consultancy services; ii. Full Sustainability Intelligent Community (City, Region, or Country) turnkey solutions. The latter implies delivering a smart eco community of different sizes, from regions to cities and towns, and master-planned developments, as ready for occupation and sustainable living. The smart city turn-key process includes: the site selection, negotiations, conception and modeling, spatial/space planning, intelligent design and engineering, construction coordination, complete delivery and centralized management, and smart urban growth.

Thus the Group implements the most viable construction strategy of intelligent sustainable cities as physical-virtual-social-natural territorial systems of innovation, intelligence, digital space and ecosystems, the most advanced urban agglomerations in the human history.

PUBLIC PROJECTS UNDER APPROVAL:

-  EU, Cyprus: SMART/SUSTAINABLE CYPRUS as a development model for a SMART EUROPE
-  EU, Cyprus : PAFOS – SMART ECO REGION

RUSSIA, Skolkovo: SMART SUSTAINABLE COMMUNITY MODEL™. The Group is planning to implement the fully sustainable model and viable construction strategy of intelligent cities with smart urban infrastructures, innovation clusters, social intelligence, digital spaces and natural ecosystems, run by a single intelligent operations and control center.

PUBLIC PROJECT UNDER STUDY

-  MOSCOW FEDERATE DISTRICT AS A SMART ECO CITY DEVELOPMENT
-  SMART/SUSTAINABLE RUSSIA (i-Russia)

PRIVATE PROJECT AS COMPLETED

EU, Cyprus: Conception and Modeling of the world's first fully sustainable intelligent community: "Neapolis Smart Eco City" (Development Costs: EUR 2,5 b). Its further construction as the smart eco city development is now under full responsibility of its current owners and promoters.

The Corporate Mission and Strategy of the Smart Group is to contribute in building a sustainable Urban World by converging physical/ecological, technological/digital, and human/social spaces.

[Information about the Smart Group can be found at the internet site: <http://www.eis.com.cy>; contact emails: abdoul@cytanet.com.cy; ontopaedia@gmail.com]