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Smart Happy Sustainable Cities Definition and Challenges

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ABSTRACT
Increased environmental consciousness and consideration, urbanization, and technological advancement have all resulted in a pressing need and opportunity to reconsider how cities are built and managed. During the previous few centuries, these interconnected issue developments have begun to coalesce under the new umbrella of Smart Sustainable Cities. The purpose of this chapter is to initiate and debate the concept of Smart Happy Sustainable Cities and smart material.The paper will also propose a definition of Smart Happy Sustainable Cities and discuss some of the key challenges associated with putting the concept into practice. While there are numerous definitions for smart cities and sustainable cities, the Combination of the two has received less attention. Furthermore, given the variety of definitions of smart cities and sustainable cities, creating such a combination is a difficult task. Nonetheless, a definition of Smart Happy Sustainable Cities is required to provide a shared understanding of the concept and to serve as a foundation for future discussions on what Smart Happy Sustainable Cities aspire to deliver.(Researcher, 2022)

Keywords: *Happy City, Computer aided architectural design (CAAD), Architectural representation, Computational design, Happiness in Communities*

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I. Developing a Definition for Smart Sustainable Cities

A concept of Smart Sustainable Cities can be defined in two ways. The first is a deductive reasoning, where the concept is created by examining and formulating how the term was defined by others in hypothesis and/or rehearse.This practices can result in a single definition or a characteristics of definitions, based on how consistent the recognised classifications are.The second method follows a positivist paradigm, in which the definition-creation process begins with a theory or proscriptive declaration about what Smart Sustainable Cities ought to be, and then a definition is explained on that basis.In practice, these "ideal sorts" of approaches are merged, either subconsciously, with one of them dominating. **(**World Commission on Environment and Development Oxford (1987))**.**

I-1 -Sustainable

Cities that are both smart and sustainable are referred to as smart sustainable cities.
One important reason for this is that the term "sustainable" is understood to be a behavioural and shaped by social concept. Sustainable Smart Cities:
The concept of definition and challenges is used to highlight a desired state or development path. This means that an inductive approach to defining sustainable development cannot be used (or sustainable or sustainability). From the top down, the concept must be defined. We depart from the Brundtland report's 1987 definition of sustainability for the purposes of this chapter. We'd like to emphasize that we abide to the entire concept, such as explanation of requirements and develop members , because this definition has been both misinterpreted and misused:
Sustainable development is defined as "development that fulfils current requirements without jeopardizing future generations' capacity to achieve their own." It includes 2 main concepts:
• the hypothesis of 'necessities,' or the vast amount of resources available to the poor and needy that must be prioritized.
• the concept of technical and digital constraints on the environment's capacity to cope with the changing." **(**World Commission on Environment and Development Oxford (1987))**.**
Brundtland's definition of sustainable growth encompasses the entire globe. An addendum is required when applied to anything less than the entire world. The Swedish government has responded by establishing a "the familial aim," whereby "the overarching objective of Swedish environmental legislation is to give the next generation a society wherein the significant environmental difficulties in Sweden have been fixed, without

enhancing environment pollution out beyond Sweden's boundaries." This type of amendment can profit not only countries, but also smaller units like cities.**(**Swedish Government: Svenska miljömål, our emphasis**)**

I-2 -Smart

The term "smart" is used as a tool rather than a basic feature in this context.Moreover, in this context, smart is perceived as a function instead of a measure of achievement. As a result,actual definition of "smart" in this chapter is "without the use of advanced technological tools." This means that intelligence is not regarded as valuable in and of itself.Smart is recognized as an instrumental concept in this context as a suffix denoting an evidence based classification of ICT-enabled products, systems, and device systems are crucial. However, It must be stated that this clarification is not universally accepted. Hollands**(**Hollands, R.G , 2008**)**, later echoed by Kitchin**(**Kitchin, R.: The real-time city , 2014) and Allwinkle and Cruiskshank [Allwinkle, S., Cruickshank . 2011sees smart not as a means to an end, However, as a means to an end, making smart as standard of living as it is sustainable. Alternatively, Neirotti et al. **(**Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., Scorrano, F , 2014**)** statement on the significance of being not unduly influenced by the phrase "smart" is defined: "The amount of "smart" actions undertaken by a municipality isn't just an predictor of city effectiveness; instead, it may consequence in an indirectly affects that captures the attempts enhancing citizens' well-being." (Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., Scorrano, F , p. 25).

Unless we had conducted a more empirical work, we would have concluded that smart is both a common thing and a viable theory, that we will explain more into the subsequent sections. This would have also led us to investigate a slightly dissimilar body of literature, such as a variety of new city planning. We believe it is unfortunate that the terms "smart" and "ICT-supported" have become somewhat replaceable. However, we now believe the idea of Smart Cities has matured to the point where It is preferable to use it and heighten its definition instead of letting it to indicate everything and so nothing. We believe that connecting "Smart" in "Smart cities" will be helpful. We genuinely think that linking the "Smart" in "Smart cities" to advanced ICT is the most constructive route to follow.As a result, employing the concept instrumentally is a prescriptive option. (Researcher, 2022)

I-3 -Cities

Cities, as a bonded organization that is smart and sustainable, are indeed a scientific classification. It is used in this context to describe the various kinds of habitat and surroundings that can report on smart solutions for sustainable development. Cities are not regarded as useful in comparison to smart. That's because the existence of cities is not considered optional, but rather a given. As a consequence, rather than focusing on whether cities as a whole contribute to sustainability, The emphasis is on how cities can be formed more sustainable. (Researcher, 2022)

There is no evidence based basis for an analytic definition of Smart Sustainable Cities. The mixture of smart and sustainable cities is indeed lacking; looking at smart or sustainable cities separately provides more material from which to draw. Nonetheless, the material on smart cities and sustainable cities is important for a descriptive definition since it establishes a framework for familiarizing the concepts of smart and sustainable with content that is linked to, and hence pertinent to, cities. As a result, until trying to present our own description of Smart Sustainable Cities, we examine how other people have defined these concepts. (Researcher, 2022)

I-4 Definitions of Smart Cities

The majority of smart city literature focuses on particular types of ICT (such as travel organizers), as well as particular possibilities (such as data), or precise application contexts (e.g. smart transport systems or smart land use planning). Nonetheless, a variety of definitions of smart cities could be discovered:

• "regions in which new advances can be used in combination with facilities, architecture, items, and including own organization to createcultural, financial, and ecological" **(**Townsend, A.: Smart cities, p. 15**)**

• "when long-term growth in health and education, along with conventional (transportation) and modern (ICT) communications networks, fuel long-term expansion and livability while also handling resources wisely through governance." **(**Caragliu, A., del Bo, C., Nijkamp, P, p. 50**)**

• "are characterised by the pervasive use of technological tools (ICT), which assist cities in creating good use of their resources in various urban domains." **(**Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., Scorrano, F, p. 25**)**

• "A 'Smart City' is classified as a large urban area that, with the assistance of pervasive ICT systems, can provide creative services to citizens in enhancing their well-being." (Piro, G., Cianci, I., Grieco, L.A., Boggia, G., Camarda, P, 2014, p. 169).

• "a city designed to resolve public issues through ICT-based techniques and municipally sustainable management." **(**European Parltackling societal problems using Information and communication technology techniques iament: Mapping smart cities in the EU. Policy Dep A**).**
• "A Smart City is a place where conventional systems and facilities are constructed more productive by the use of virtual and communications system techniques to the benefit of its residents." **(**European Commission: Digital Agenda for Europe—About Smart Cities (2013).**)**
• "Numerous associations of physiological, virtual, and social processes in the building design that provide its residents with a sustainable, forthcoming years will be fruitful." **(**British Standards Institution (BSI), p. 4**).**

Throughout attempt to further define the principle, many studies, such as **(**Caragliu, A., del Bo, C., Nijkamp, P**)**consider the results done at the Vienna University of Technology's Centre of Regional Science **(**Centre of Regional Science at Vienna University (eds.) , 2007**),**which considers the smart city concept to have six axes or types of activity as shown in figure 2-1:

• Smart economy
• Smart mobility
• Smart environment
• Smart people
• Smart living
• Smart governance

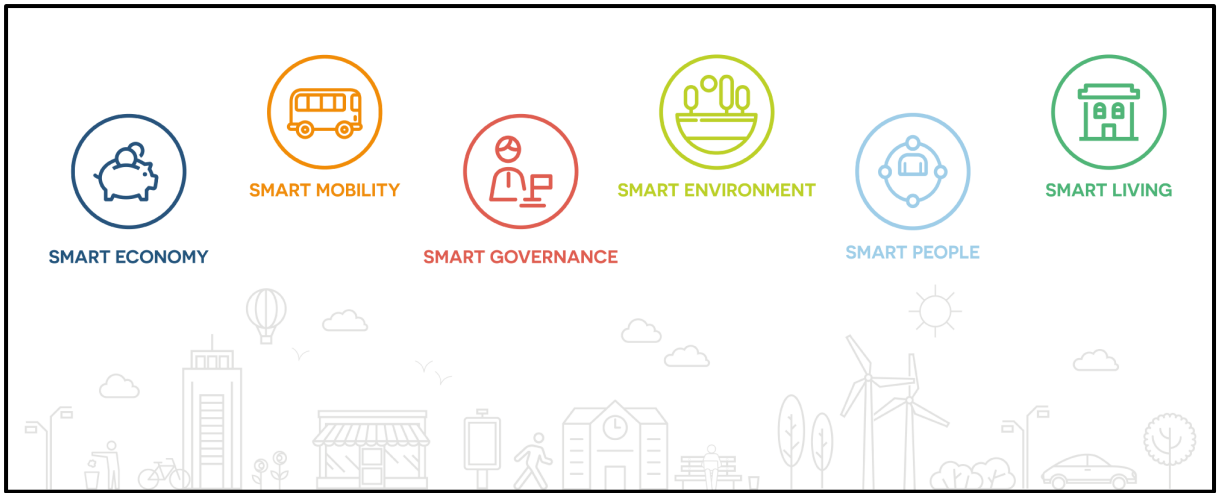

Figure 1-1:Smart City six axes (Source :https://www.smart-city.uliege.be/cms/c_6946640/en/the-smart-city-in-6-dimensions)

I-5 Sustainable Cities

As stated previously, "sustainable cities" initiatives have traditionally concentrated regarding techniques in order to improve city digestion. Typically, the real focus is now on a city's environmental sustainability.performance that happeninside the city's constraints. When these two practises are combined, only a portion of the challenges and opportunities associated with urban sustainability are recognized.

The major reason for this is that few (if any) cities are self-sufficient.The city depends heavily on the rural areas to help its citizens' lives by drawing assets from it and disseminating toxins. Historically, this countryside was close to the city, beginning approximately also on opposite side of the city wall .Furthermore, as a consequence of technical progress, urban sprawl, and modernization, a growing proportion of the products consumed in cities is produced ever more distant This implies that the environment effects of a city's ingestion are dispersed throughout the world, and as a result, A city's carbon footprint cannot be reduced to urban growth within city boundaries.As a consequence, a thorough understanding of the fundamentals of ecological sustainability requires a global view wherein sustainability analyses and urban developments are considered while keeping the global implications of local acts or omissions in mind.

Aninternational viewpoint could be approached in two aspects. One approach is to employ an output financial strategy with a long life evaluation, that also indicates that a city's influence is ascertained by the output that occurs inside its borders, along with all the input's and output's repercussions factored ,The second strategy is to use a consumption budgeting method. in which the effect of a city is entirely determined by its residents' consumption, irrespective of where the consumed goods are produced. A consumption-based account, on the other hand, is founded on a familial sense of reality and emphasises intraspecific as well as intergenerational equality As an outcome, The guideline that characterises in which ICT solutions are

included includes not just to infrastructures, methods, and everyday life inside the city, as well as the entire life - cycle of commodities produced by inhabitants.**(**Kramers, A., Wangel, J., Johansson, S., Höjer, M., Finnveden, G., Brandt, N , 2013**)**

A consumption-based accounting perspective is the only viable path forward for addressing climate change issues and the redistributive unfairness of environmental risks and revenues. When considering the social aspects of sustainability, the concern of control limits is also important. Many of the Smart City framework described here are solely concerned with the ICT use phase, ignoring the quality of life of people involved in other stages of ICT's living (e.g. working in mining, production and disassembly). While this method of marking analysis borders feels right at the level of urban governance and planning, other factors must not be overlooked. (Researcher, 2022)

I-6 What Could We Mean by Smart Sustainable Cities?

The concept of Smart Sustainable Cities (SSC) should be viewed as a wholeAs demonstrated in Figure 2-2, all three factors must be prevalent for an organisation to be classified as a smart sustainable city; Alternatively, the concept is categorised as a smart city, a sustainable city, a smart sustainable development case, or otherwise.

Some meanings of smart cities that have been identified include sustainability as a key componentAs a result, One could assert that the smart city is also the smart sustainable city, and that the term "sustainable" is unnecessary. There are, even so, a variety of reasons why it should be sustained.

To begin, Although some smart city principles incorporate sustainability, this is not always the issue.

According to a review of the literature on smart city concepts, **(**Kramers, A., Höjer, M., Lövehagen, N., Wangel, J , 2014 **)** Few of these included

explicit environmental sustainability goals.

This is consistent with Neirotti et al ‘s findings of. **(**Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., Scorrano, F , 2014 **)**"Among two popular kinds of application areas for smart city efforts were determined to just be "Transportation and Mobility" and "Natural Resources and Energy" from across 70 cities studied. One possible explanation for the findings of Kramers et al.**(**International Telecommunications Union (ITU) , 2014**),**on the one hand, and by Neirotti et al. **(**Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., Scorrano, F , 2014 **)** and commissioned by European Parliament **(**European Parliament: Mapping smart cities in the EU. Policy Dep A , 2014 **),** On the other hand, different analysis is made because there is a gap between how smart cities are interpreted in theory and how they are implemented in practise.

Cities are theoretically interpreted and practically implemented. Second, none of the smart city concepts listed identify or clarify what sustainability (or a sustainable city or sustainable urban development) entails.It's extremely vital when resolving conflicts between two or more sustainability goals. When addressing differences between two or more sustainability goals, it is also essential. Because none of the existing smart city definitions give a framework or prioritization of smart characteristics or application programs, smart economics, smart mobility, smart environment, smart people, smart living, smart government, are also all assigned the same value (Researcher, 2022)

Furthermore, whereas the principle of a smart city can break out with not specifying sustainability, a smart sustainable city faces more challenges.

We selected to frame the idea of Smart Sustainable Cities on the Brundtland concept as a first attempt to explain the idea, while keeping the previous topic in view.

A Smart Sustainable City is a city that

- meets the needs of its present inhabitants
- without compromising the ability for other people or future generations to meet their needs, and thus, does not exceed local or planetary environmental limitations, and
- where this is supported by ICT.

Figure 1-2: Smart Sustainable definition(Source: Researcher, 2022)

II. Examples of smart cities in Europe and China

Smart City is a city development concept that combines elements of ICT and urban studies With the effects of globalisation on the borderless economy, innovation of mass communication has the potential to significantly improve a city's sustainability by facilitating its management. Smart City is a model for cities that want to stay competitive in the face of rapid technological advancement. The Smart City collaboration between China and Europe, which resulted in the Smart Cities shown in the table, exemplifies the worldwide prevalence of Smart Cities. Iskandar Malaysia was designated as the pilot city for all Malaysian Smart City projects in 2012. According to the definition in Table 2-1, a smart city is a type of city development that can refer to both new and existing cities.(IRDA, IRDA Annual Report 2013).

Table 1-1: Examples of Smart cities in Europe and China(Source: IRDA, IRDA Annual Report 2013)

EU Smart Cities	Chinese Smart Cities
Amsterdam, Netherlands	Beijing Haidan District
Barcelona, Spain	Tianjin Binhai New Area
Bristol, UK	Shanghai Pudong New Area
Copenhagen, Denmark	Yangzhou of Jiangsu Province
Florence/Prato, Italy	Nantong of Jiansu Province
Frankfurt, Germany	Huai'an of Jiangsu Province
Issy-les-Moulineaux, France	Ningbo of Zhejiang Province
Lyons, France	Jiaxing of Zhejiang Province
Malmo, Sweden	Zhangzhou of Fujian Province
Manchester, UK	Yantai of Shandong Province
Riga, Latvia	Guangzhou Nansha District of
Tallinn, Estonia	Guangdong province
Venice, Italy	Authority of Qianhai Shenzen-
Vilnius, Lithuania	Hong Kong Modern Service
Zagreb, Croatia	Industry Cooperation zone of
	Shenzen, Guangdong
	province
	Zhuhai Hengqin New Area of
	Gunagdong province
	Chengdu of Sichuan Province
	Korla of Xinjiang Uygur
	Autonomous Region

Giffinger et al. provided the most influential conceptual construct of Smart City among the myriad definitions of Smart City (2007).This is the framework that Iskandar Malaysia used in developing Smart City framework.

However, it is incorrect to believe that the Giffinger et al. model is sufficient in providing an accurate assessment of a city's smartness.

A city is distinct because of its physical, demographic, and social economic characteristics that distinguish it from other cities. Following this logic, an assessment of a city's smartness should be made in relation to the city's own needs and goals. This concept served as the foundation for the creation of a practical Smart City framework that serves as a model for "localised" assessment of cities. This part uses the Giffinger et al.‟s Smart City model to propose a pragmatic framework that helps to assess a city‟s smartness by comparing the city‟s Smart City Ideal against its actual smart initiatives. The "Reconciled Smart City Assessment Framework" or RSCAF is a pragmatic framework that is beneficial in revealing the areas of focus in achieving the city‟s penultimate Smart City ideal, thus promoting effective and efficient decision-making practice as shown in figure 1-3.**(**IRDA, IRDA Annual Report 2013**)**

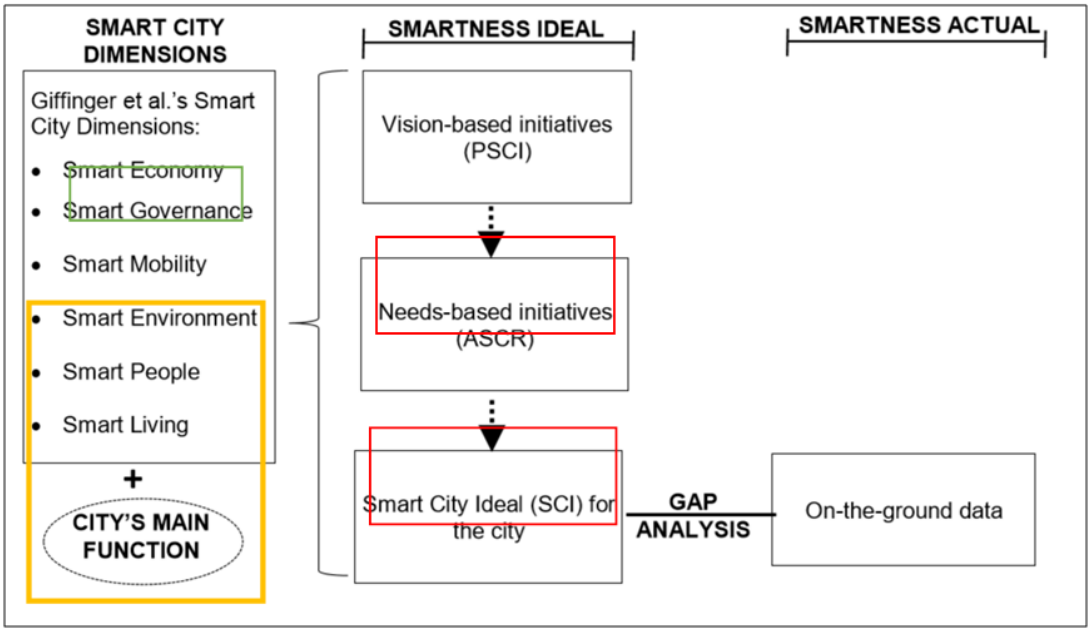

Figure 1-3: The Reconciled Smart City Assessment Framework (RSCAF)(Source : Researcher 2022)

III. THE FRAMEWORK: RECONCILED SMART CITY ASSESSMENT FRAMEWORK (RSCAF)

To summarise the preceding discussion, the Aspects of Smart Cities and the city's core objective, the city's designed smart proposals, and the actual requirements of city stakeholders, as well as on smart initiatives are key parts of the proposed framework to analyse a city's smartness.The Reconciled Smart City Assessment Framework (RSCAF) is the name given to the suggested framework (Figure2-3).The main principle of RSCAF is to determine the gap between the city"s Smartness Ideal against its Smartness Actual.

The RSCAF overall assessment operation is currently being implemented by the Smart City dimensions and the city's key role. In terms of consistency, determining Smartness Ideal and Smartness Actual should be based on the six factors proposed by Giffinger et al., rather than smart city dimensions proposed by other authors, especially if RSCAF is to be used in a future task. The city's primary function plays a subtle but critical role throughout the assessment process, serving as a baseline or frame of reference when comparing Smartness Aspiration and Smartness Actual .

The Smartness Ideal in RSCAF refers to the process of determining the Smart City Ideal for the city (SCI). First, perception initiatives are identified as Planned Smart City Initiatives (PSCI). The PSCI are then used to generate a survey form in order to investigate the city's stakeholders' Actual Smart City Requirements (ASCR). ASCR is a needs-based investigation that takes the form of a questionnaire survey among city users to determine their level of satisfaction with the PSCI. The Likert scale is the primary rating method in the questionnaire survey. This rank denotes users' expectations based on the assumption that users' satisfaction ratings also reflect, to a large extent, their anticipation level. The analysis and interpretation of ASCR denotes SCI. a complete and accurate configuration of Smart City initiatives that the city should have in order to achieve a level of smartness that corresponds to its main role.(IRDA, IRDA Annual Report 2013)

IV. Smart City Frame work

Smart city Framework with leads to happy city as shown in figure 1-4 .

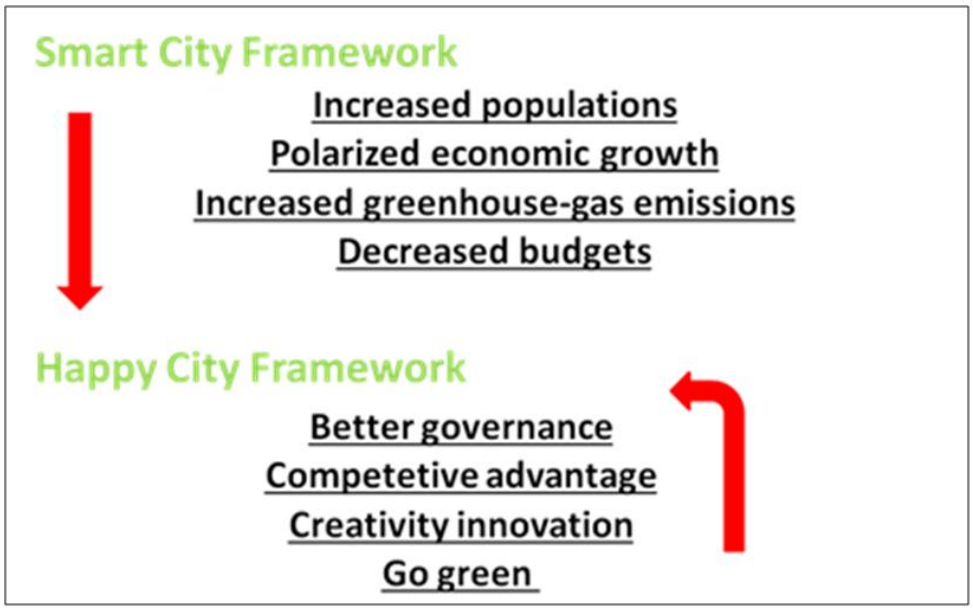

Figure 1-4: Smart City Framework (Source : Researcher , 2022)

V. COMPONENTS OF THE PROPOSED SMART CITY ASSESSMENT FRAMEWORK

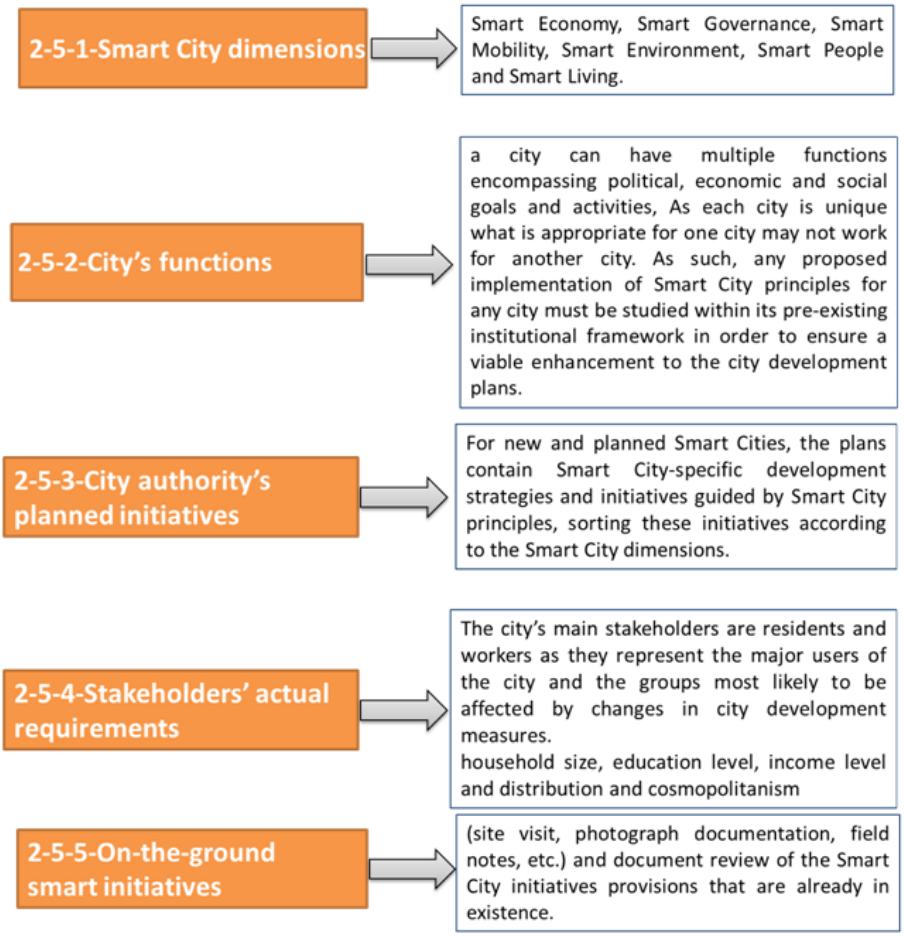

Figure 1-5: COMPONENTS OF THE PROPOSED SMART CITY ASSESSMENT FRAMEWORK (Source : Researcher, 2022)

VI. Smart Materials

We have realised over the last century how to advancement of technologies materials that match our specific requirements in terms of strength, longevity, weight, adaptability, and charge

Smart materials are the ultimate shape shifters .

(https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

6-1-IMPORTANCE

Greater efficiency and maintenance work,In a society of health and safety threats, they provide progressively successful, robotics prediction, and even self-repair. They may provide intelligent bio warfare focused tracking and information gathering in politically salient environments in a world of political violence. (https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php).

Throughout overall, there are three types of smart materials.

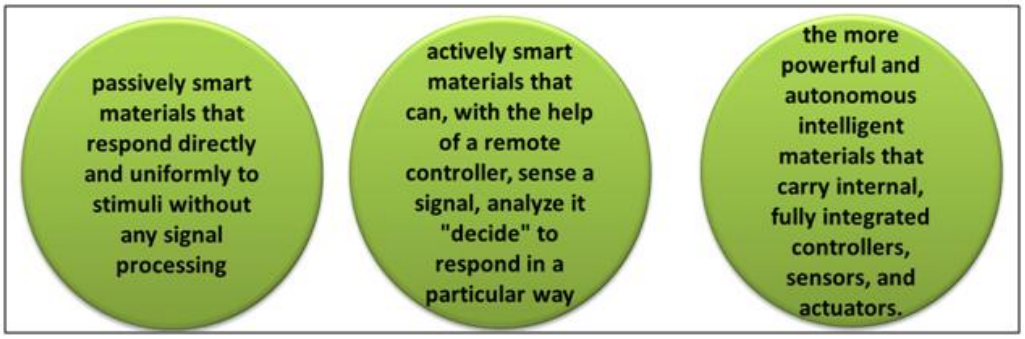

Figure 1-6: Smart materials three distinct flavors(Source : Researcher , 2022)

6-7-2-USES & APPLICATIONS

They are classified and categorised into several classes ,such as : piezoelectrics, electrorestrictors, magnetorestrictors, shape-memory alloys, and electrorheological fluids. as shown in figure 1-7. (https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

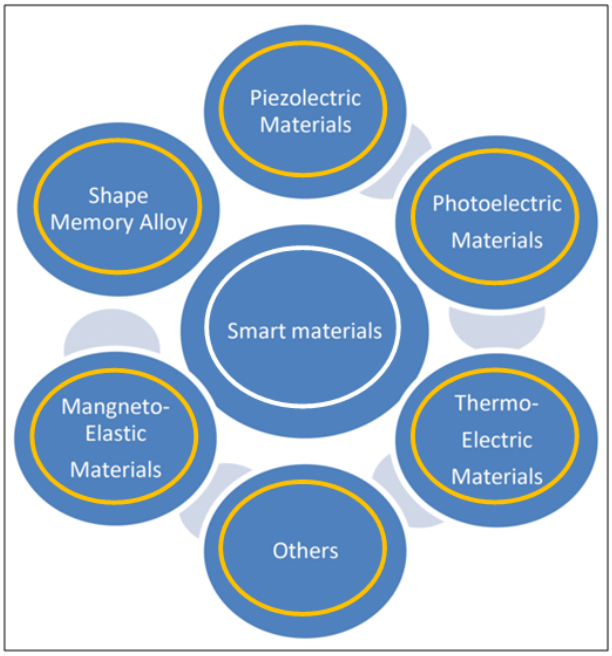

Figure 1-7: Smart materials Classes and categories(Source : Researcher , 2022)

6-3-Smart Materials Examples

6-7-3-1- Piezoelectrics

When subjected to mechanical strain, piezoelectric materials generate an electrical field.

A material expands and contracts when an electrical field is applied to it. As a result, they can produce very little wattage from purely mechanical movements and change the shape of surfaces in response to electrical impulses. Intelligent materials, such as those found in snow skis, are a prime example of this. Piezoelectric elements dampen shock and increase efficiency throughout a run by adjusting ski stiffness to slope conditions, as shown in Figure 1-8. (https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

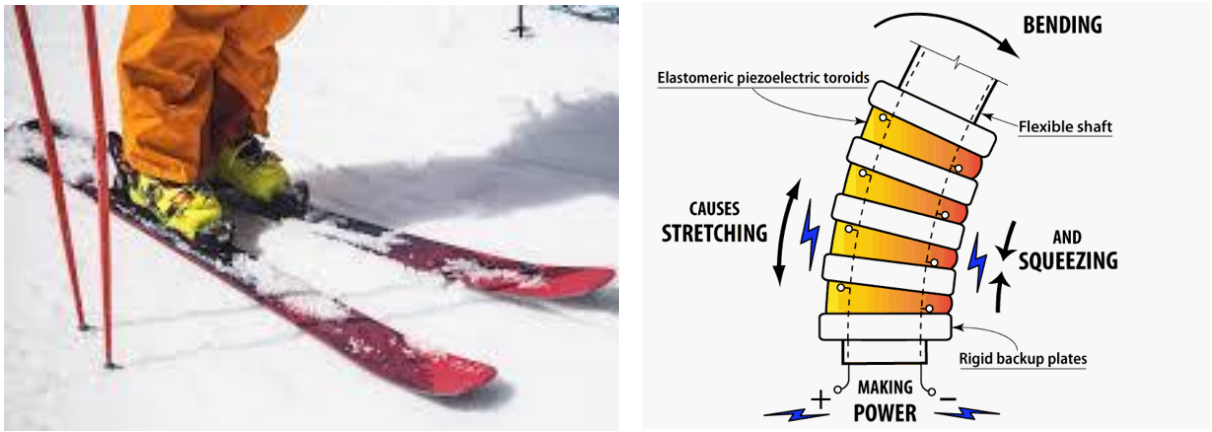

Figure 1-8: Piezoelectrics in snow skis
(Source:https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

6-3-2-Magnetorestrictors

These resources are reciprocal devices capable of both "receiving" and "sending" data contained inside the processes in which they exist, similar to piezoelectrics. Apart from piezoelectrics, magnetorestrictors react to a magnetosphere instead of an electromagnetic current .Magnetorestrictors are used in a wide range of applications, such as machine tools, sensors, and sonar systems. Magnetorestrictors could also be used to reduce vibration (in industrial machinery or motorcars), in carburetors, and in the reconditioning process (relining)to control vibration (in factory equipment or automobiles), in fuel injection systems, and in the retraining procedure (relining) of old water pipes. (https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

6-3-3-Shape Memory Alloys (SMAs)

This unique category of responsive substanceswill easily transform waste heat into steam turbines.Smart shape memory alloys, for example, is also "configured" to implement a distinct appearance after being heated to a specific heat (say, 100o Fahrenheit). (https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

SMA devices could also enhance fire detection equipment

6-3-4-Electrorheological Fluids

These are fluid colloidal dispersions in which the smart material is distributed within a fluid but not disintegrated. Once exposed to an electrical field, these suspensions undergo changeable modifications in wettability characteristicslikerheology, compressibility, and stretch ability. These treatable adjustments occur as a result of the controlled exchange of micrometres "intelligent " hanging During the gelation. In the automotive industry, commercial advances in smart hydrodynamic liquids, connected car suspension processes, and smart suspension systems are already in the works. (https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php).

6-3-5-FIBRE OPTIC SENSING

Fibre optics is used as a sensor to mimic the action of traditional strain gauges. They react to changes in the amount of light that is conveyed. Changes in frequency, phase, frequency, polarisation, wavelength, or mode are all possible. They are oversensitive, can detect minute variations, and thus perform admirably. Sensors are classified into three types: The Intensiometric responses to any change in the intensity of the light transmitted, such as flexing or twisting. These strain-sensitive phase sensors are available in a variety of setups., as illustrated in figure 1-9 for a smart bridge.

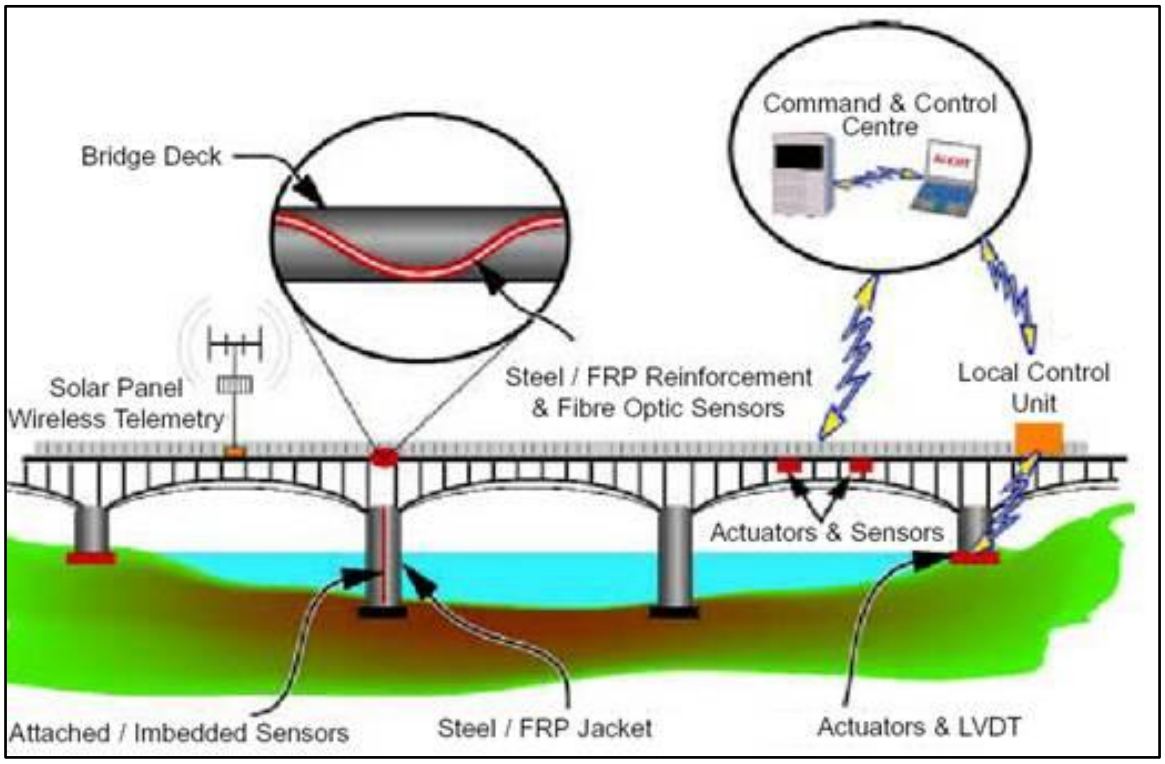

Figure 1-9: A Schematic view of s smart bridge(Source: https://www.seminarsonly.com/mech%20&%20auto/Smart%20Materials.php)

VII. The main objectives of Using Smart materials:

- Raising the efficiency of buildings and materials in Alexandria by reducing the rate of energy consumption of harmful emissions.
- To identify a list of material relevant less embodied energy.
- Identifying and assessing components that help to reduced emissions and operational energy in substances. In addition, damaging volatiles and hydrocarbons emitted by major projects in Alexandria, Egypt, will be reduced.
- Using -Smart Materials, evaluate engineers' consciousness in Egyptian companies.
- lessen the citizenry's exposure to building defects in the long term.(Researcher, 2022)

VIII. Measurement System of Performance Building

Numerous countries have created personal property specifications for constructions; the chart describes several instances of current building Environmental assessment (BEA) tools.(The American Council for an Energy-Efficient Economy (ACEEE)

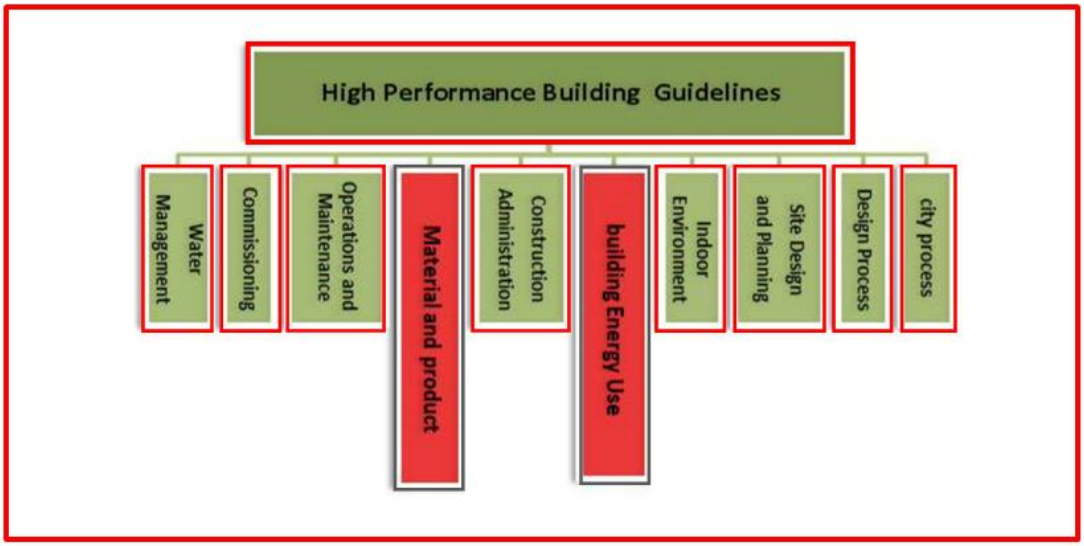

Figure 1-10: High Performance Buildings (HPB) (Source : Researcher , 2022)

8-1 -Definition of Building Performance

Sustainability Committee definite Building performance as a sustainable building with cleaner and greener, economic, and social economic specs, It should be enchanting, secure, healthy, and comfy, construction methods , along with o&m (O&M) and must manage with a professional rate of life span environmental, resource, and economic efficient, (HPB) is also termed to as a "conserving energy " (The American Council for an Energy-Efficient Economy (ACEEE).

8-2- Measurement System of Performance Building

So several nations have formed their own efficiency in terms of energy standards for buildings; the table below demonstrates several cases of building Environmental assessment (BEA) tools that are currently in use. (http://www.building.co.uk/essential-guides-breeam-leed-green-star-and-estidama/5002213.article).

8-3- Embodied Energy of Building Material

The 'energy inputs' of a substance refers to the energy exerted inside its manufacturing, like the effort consumed in the producing of the material. expended in raw material extraction and energy expended in transportation and manufacturing, as illustrated in figure 1- 11.(Juan, Y. K., Gao, P., & Wang, J. (2010).)

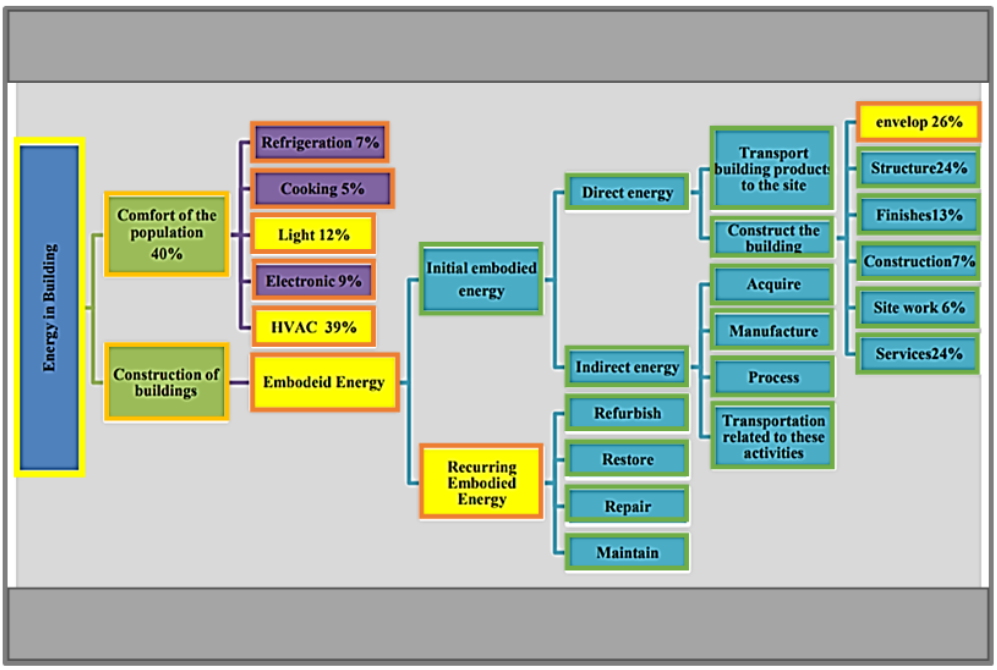

Figure 1-11: Energy in Buildings(Source : Researcher , 2022)

IX. Materials Resources

Natural resources are typically classified as renewable or non-renewable. Renewable resources are those that can be repeated or gathered on a routine basis, like wood for building projects or flaxseed for oil paint. They are just renewable as long as the right circumstances for producing are retained; depletion of the ozone layer is an example of how many renewable resources' conditions can be significantly altered. Non-renewable resources are those that can be collected when; both are frequently known to as "mines ", or assets that form sluggishly, such as oil products. (Berge, the Ecology of building materials, second edition)

9-1- Life Cycle Materials

After food production, the construction industry is the world's largest consumer of raw materials today. This is especially important for scarce nonrenewable resources, however, to everyone else, because material throughput in the The market is intertwined with significant social and climate demands, as illustrated in Figure 1-12.(Berge, the Ecology of building materials, second edition)

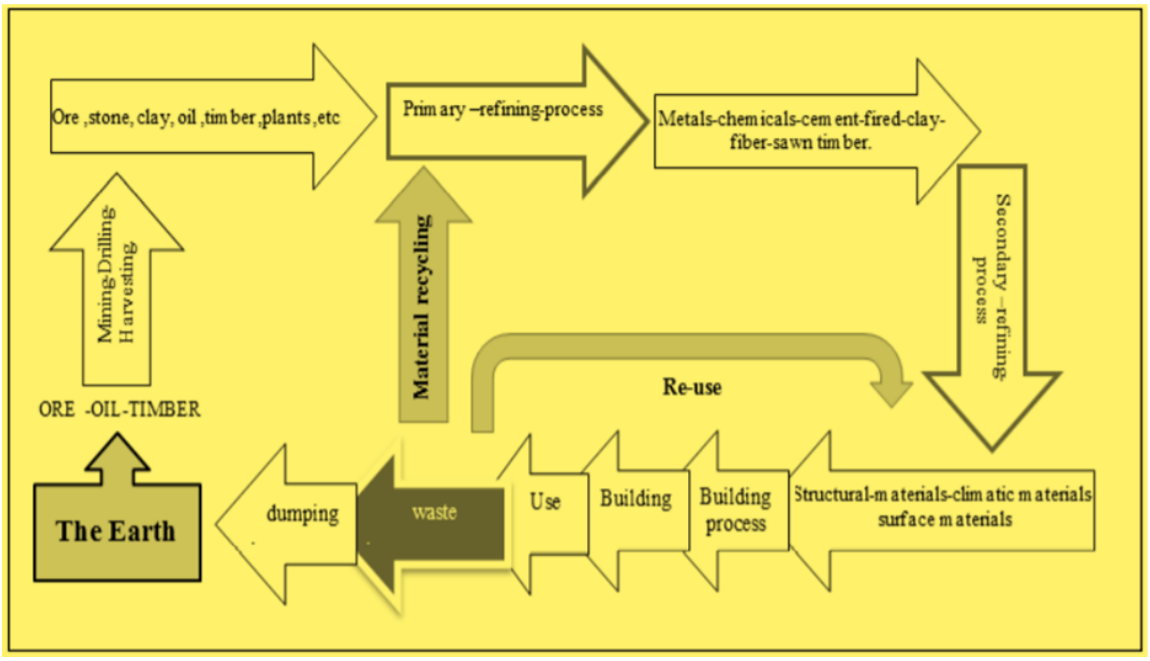

Figure 1-12: Life cycle Material (Source : Researcher , 2022)

9-2 General Materials Trends

The eight trends listed below imply what is actually running new material scientific research all around community. as shown in figure 1-13. (Barbara Bell, Fpinnovation, Material Intelligence)

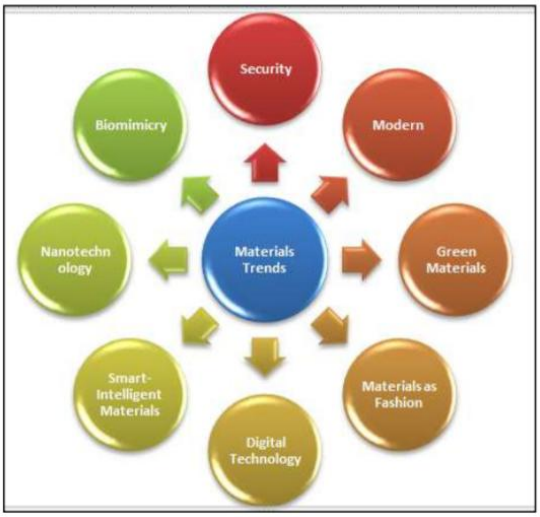

Figure 1-13: Material trends (Source : Researcher , 2022)

9-3- Materials can be broken down into five major categories

Metals, plastics, rubbers/elastomers, natural engineering materials, and natural materials are all examples of materials. as shown in figure 1-14. (Barbara Bell, Fpinnovation, Material Intelligence)

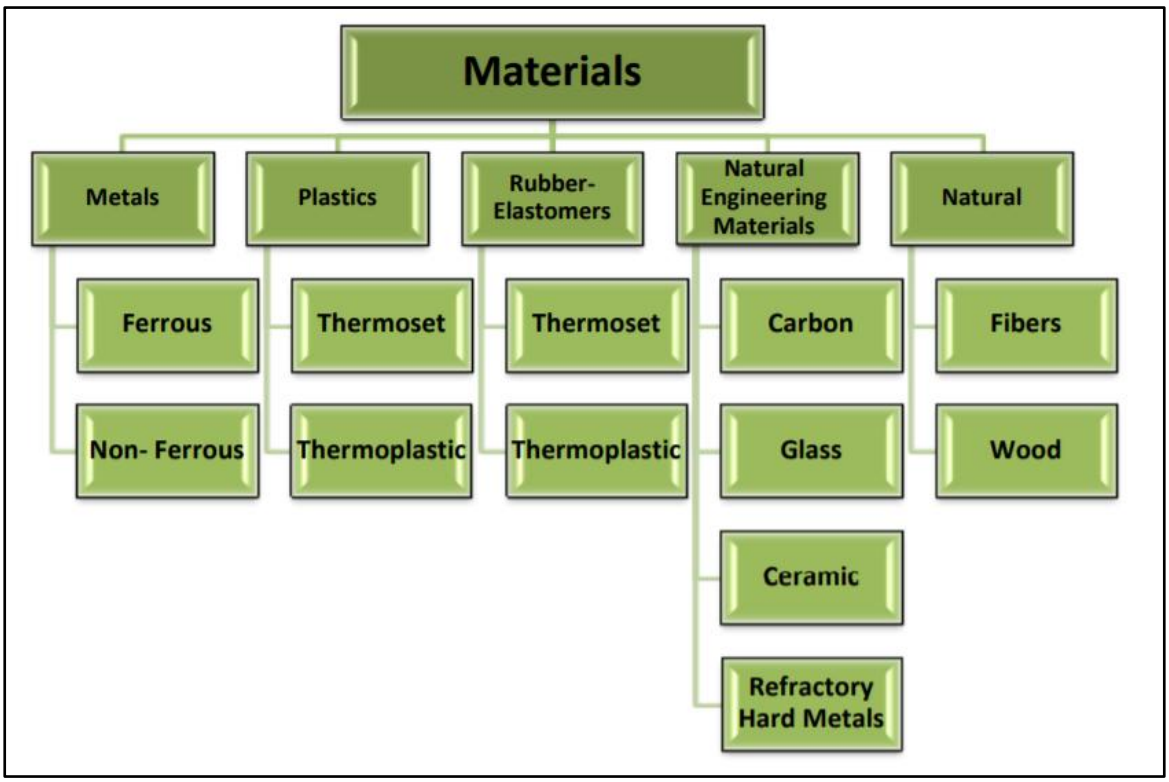

Figure 1-14: Materials Flow Chart (Source : Researcher , 2022)

X. Definition of Smart

The concepts 'smart,' 'functional,"multifunctional,' and'smart' are considered synonymous.

For the first three terms, this is sensible, if perplexing, but the last almost strongly suggests a form of awareness that does not exist in any non-biological system. as shown in Table 2-2. Carlton(Carlton House Terrace,U. K. Congress, Institute of Materials, Minerals and Mining (IOM3))

Table 2-2: Smart are Classified in Three Groups(Source : Researcher , 2022)

Non- Smart	Don't have any special characteristic
Semi-Smart	Able to change their form in response to environment effect, for once or short time
Smart	These changes will be repeatable and reversible, known as "flexible" and "adaptive", and this is due to their particular feature in adjusting to environmental conditions

11-1- Smart Materials Classification

There are two types of smart materials and systems. as shown in figure 1-15. (D. Michelle Addington, Daniel L. Schodek, Architectural Press, 2005)

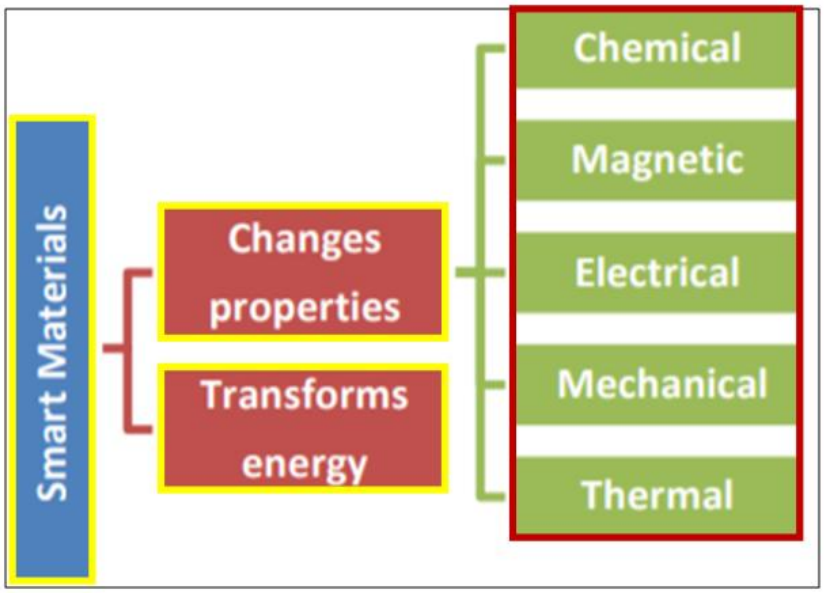

Figure 1-15 : Smart Materials Classification(Source : Researcher , 2022)

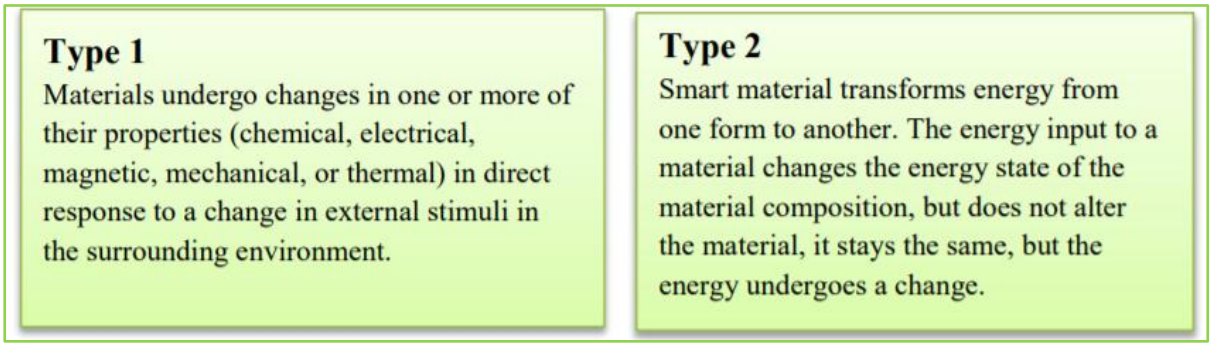

Figure 1-16 : Explain types of Smart Materials (Source: Schwartz, Mel M, (2002), The Function of Smart Material's behavior in architecture)

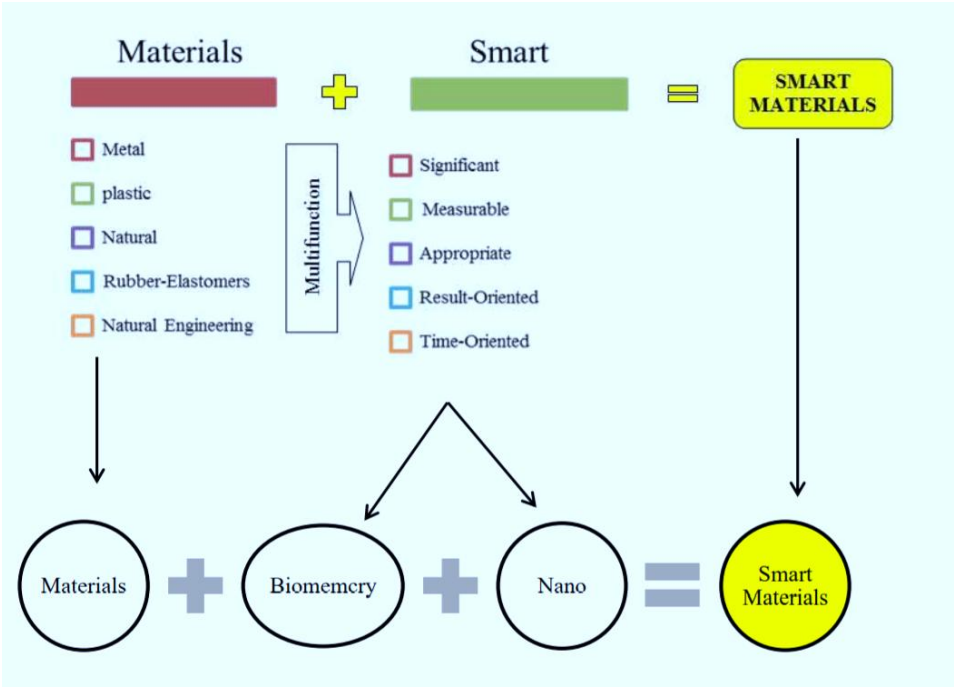

Figure 1-17 : Smart Materials Flow chart (Source : Researcher , 2022)

XI. EXAMPLES AND APPLICATIONS OF SMART MATERIALS

Materials science is a never-ending source of new inventions that have the potential to transform our future. Below, we look at some of the most incredible materials from latest days:

- **Synthetic spider web.**This substance is also not 5 times stronger than steel, but it is also lighter, but it is also extremely pliable. Its possible uses entail bullet resistant garments, burn skin substitutes, as well as water resistant glues.
- **Shrilk.**Chitin, a carbohydrate found in krill shells, is its main component. It was developed by Harvard University researchers and is regarded as the ideal plastic substitute due to its quick decomposition and ability to stimulate plant growth.
- **Graphene.**Its potential uses are nearly limitless: more autonomous batteries, cheaper solar Photovoltaics, speedier devices, more adaptable digital equipment, more resistant buildings, biomimetic appendages, and etc.All these are made possible by their excellent potential. faster computers, flexible digital equipment, impervious buildings, bionic limbs, and so on. Everything is feasible because of their diverse assets, as illustrated in Figure 2-18
- **Metamaterials.**They are created in the research lab of unexpected parameters that do not occur naturally, and they are being studied in sectorslike the armed services, photonic, and telex. They could fold electro - magnetic light rays, such as instance, leads to adverse refraction.
- **XPL.**This is a polyester with an elastomeric core. that acts as a base layer on the skin's surface.

It was developed by researchers at the Massachusetts Institute of Technology (MIT) to imitate the looks of youthful, clear skin by revitalising the user's appearance. (Graphene-Flagship, APS Physics, Springer Nature.)

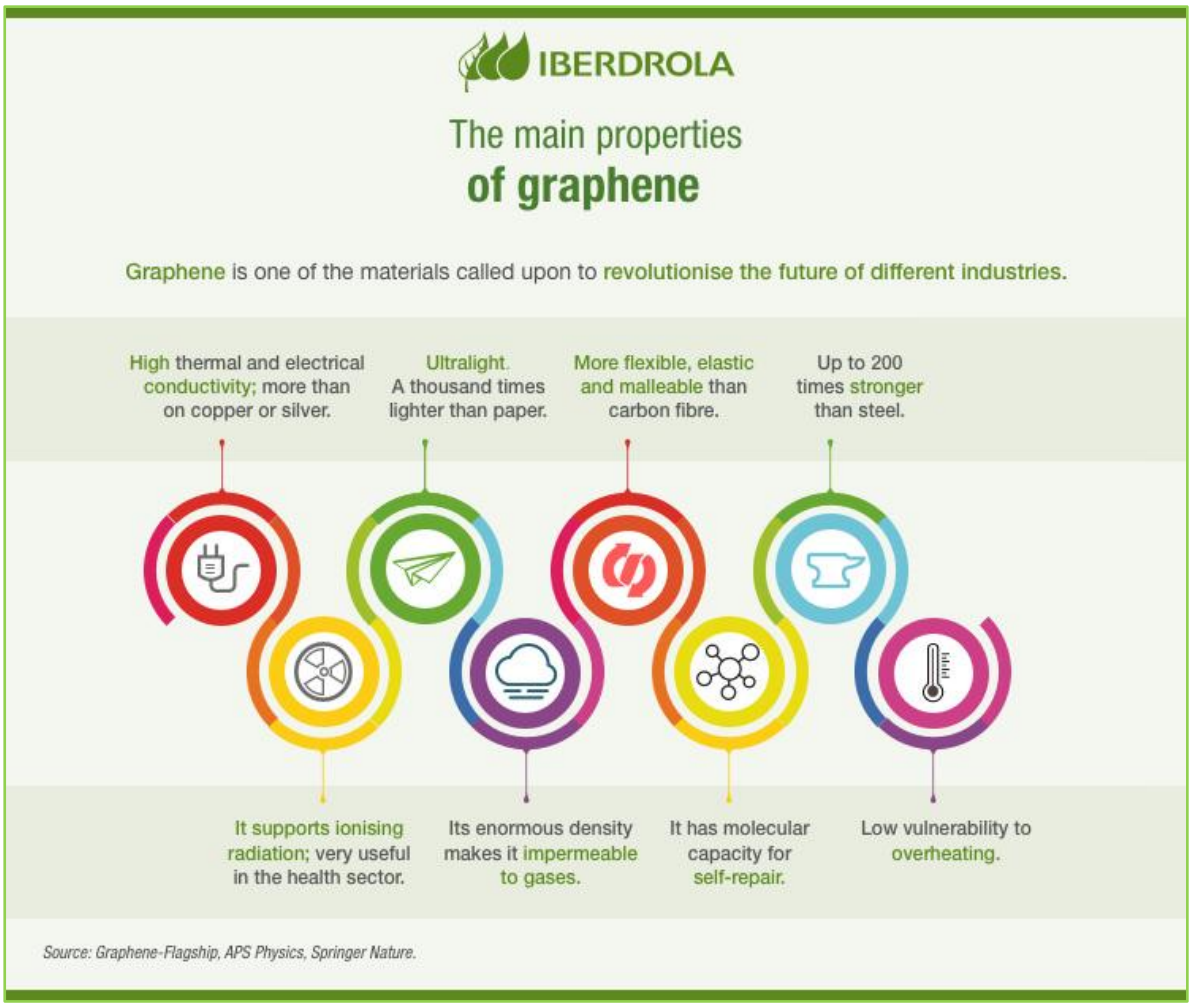

Figure 1-18: The main properties of graphene (Source : https://www.iberdrola.com/innovation/smart-materials-applications-examples)

XII. Why are happiness and well-being being given so much more attention by governments around the world?

Why are countries from all over the world committing to the UAE's Global Happiness and Well-being agenda? After all, the key to happiness predates politics.

Nonetheless, three factors are propelling satisfaction and fulfilment to the forefront of geopolitics debate. For starters, an increasing number of countries recognise that population development itself will not generate pleasure. Foremost, just like basic research has shown, happiness and well-being can now be rigorously monitored and researched. Finally, new and effective public policies are being implemented to improve societal well-being. This Strategy Report on Worldwide Health and Happiness is built on the concept that the "aspiration of enjoyment" must no longer be remaining to individuals or markets alone.Pleasure and well-being ought to be a top priority for all of society, involving governments, businesses, colleges, medical systems, and other segments.(the-uae/the-uae-government/government-of-future/happiness).

XIII. Conclusion

This paper provided a definition of Smart Happy Sustainable Cities as well as some of the key challenges involved in putting the concept into action. Examples and definitions of Smart Materials A definition of Smart Happy Sustainable Cities and Smart Materials is still required to deliver a common awareness of the role, as well as to serve a foundation for various context in defining what Smart Happy Sustainable Cities should be and how it has a positive and effective impact on its users' happiness.

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