Sustainable Architecture
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Lecture 15
Green Building Rating and Components

Good morning, welcome back to this new lecture of the online course on Sustainable Architecture and current lecture is on Green Building Ratings and Components. Continuing from the previous lecture, where we discussed the process of creating sustainable buildings which synonymously, we are calling as green buildings now, though we very clearly understand that there is a clear difference between sustainable buildings and green buildings.

We from now on in this course will focus more on the process of delivering green buildings because that is more tangible. And the parameters and components of green buildings are largely the environmental components which we have seen that they are more tangible easily quantifiable measured, monitored, verified. And hence it is easy to assess and measure the performance of a building which needs to be qualified as a green building as compared to the sustainable building.

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So, here we start with the green building ratings and their components. So, just to give you an overview the green buildings usually they comprise of components which can be

clubbed under one of these features and these five components are invariably present in green buildings. The first one being the site, second is water efficiency, third is energy and atmosphere, fourth is materials and resources and the last one being indoor environment quality.

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Now, if we talk about the history of how green building rating programs across the world have been developed, which comprise of all of these components which we just discussed. Giving different weightages to these components, placing more emphasis on one component depending upon the context in which the green building rating program was developed, we see that we have come a long way.

So, it all started in 1990 when for the first time BREEAM was launched in UK and from then in 1992 we have already seen that the Rio conference of United Nations happened and that was the same time when US Energy Star was launched. In 1993 US green building council was formed US GBC, further to that US Green Star homes was launched, but it was not a very successful program. However, by this time BREEAM was doing reasonably good and almost the entire UK was following going ahead with BREEAM.

In 1998 for the first time USGBC came up with the LEED program which is one of the most successful green building rating programs across the world along with BREEAM. So, 8 years after BREEAM was like the first, green building rating program was

launched 8 years later; in 1999 further variations to the star rated programs from US came out. So, earlier it was Energy Star only for homes and then it the new one was Energy Star Office. In 2000 the second version of LEED came out so, that emphasized that the green buildings the practice itself is changing with time and hence the revised versions were required.

In 2001 Japan created it is own rating system which is CASBEE and 2001 was the year when Indian Green Building Council was formed IGBC, IGBC was initiated in 2001 and that was the time when the first project first green building project of India was also started that is CII Sohrabji Center which is in Hyderabad; so, this the same year when green building movement in India actually started.

So, there were discussions there were talks we were still doing a lot of work as far as climate responsive buildings is concerned, there were architects' stalwarts who were making climate responsive passively designed buildings, ecological buildings. But formally, the Indian green building council was launched in 2001 which is an important year for us in India.

In 2002 first Green Build Conference was organized in United Nations and Canada GBC and world GBC was formed in 2002. So, we can see that a lot of momentum was getting picked up from the first rating system coming up in 1990 and in 10 years several green building councils were formed to three more Green Building Rating Systems were launched. In 2003 Australia GBC was formed and the Green Star Rating tool was launched.

2004 LEED launched the versions for existing buildings. So, so far it was only for the new construction and see while in 2004 it was diversified and it was felt that existing buildings can also be converted into green buildings. So, that is where we see a shift happening from new construction to existing buildings around 2004.

2005 Singapore Green Mark was launched, 2006 the Living Building Challenge was launched, 2007 German Sustainable Building Council DGNB was formed and the first US Green Globes Certification came into place. 2008 was the year, which was the year when global financial crisis was happening and that was also the year when BREEAM registrations crossed 1 million buildings and homes.

So, this was happening 18 years after that, but it established that across the world green buildings were happening, the green building movement was picking up. 2009 the new version of LEED and BREEAM international was launched; 2010 Green Globes ANSI Standard was approved for new construction again and LEED existing buildings certification area in 2011 it overtook the new construction area.

This was happening predominantly in the US and in United States after the global financial crisis much more than the new construction the existing buildings were being retrofitted and renovated. So, the potential buildings then instead of new buildings were the existing buildings and that crossed the new building mark new construction mark.

So, this was again a shift establishment of a shift, in 2012 national green building standard was created, in 2013 US federal GSA accepted both LEED and green globes and the fourth version of LEED was launched. So, the improvisation improvements in the existing benchmarks were happening simultaneously.

In 2014 LEED was being used in more than 140 countries, BREEAM was updated and a lot of new green building rating programs were added. By 2015 world GBC was present in more than 100 countries by 2015, in 2016 LEED version 4 was mandated in US and besides this besides this journey where the development of rating programs across the world are shown it is still not comprehensive. There are many-many more rating programs which are existing which were developed in different countries and are being practiced in those specific countries and also almost rest of the world.

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So, some of the green building councils and reach programs at these so, we have US GBC, we have W GBC, we have green building council of Australia, Emirates GBC, we have green building council of Sri Lanka which is relatively new one, we also have a new one green building council of South Africa, we have Hong Kong GBC, we have Japan which is CASBEE.

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And if we look at this particular map global map, we see that there are more than 30 different certification programs, which are practicing across the world from LEED to

Green Globes to BREEAM to CASBEE to GREENSHIP, LOTUS, BEAM Plus, Green Star, NABERS, Green Mark, IGBC, GRIHA is also there in India which is missing from this particular chart we have DGNB.

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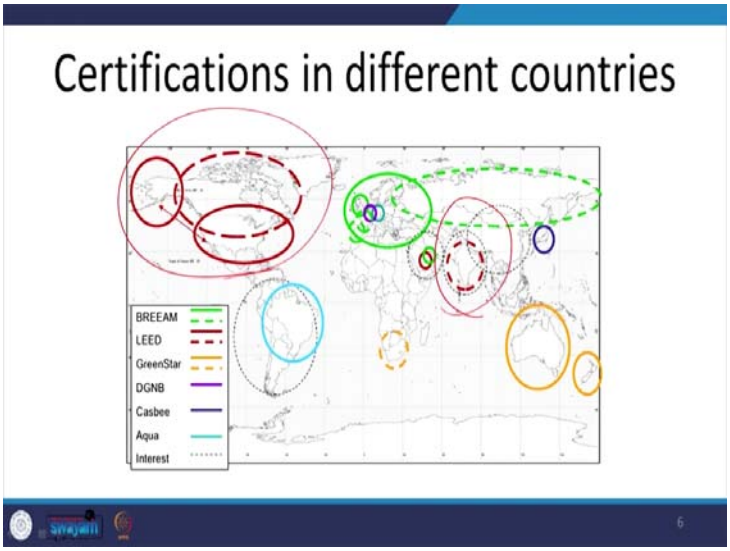

So, we have a lot of them and if we look at their impacts impact areas across the world, we see that LEED has quite large impact area in the globe. And there are other rating programs which were inspired or which have taken up from the LEED and developed on their own. For example, IGBC in India initially started on the same lines as US GBC and LEED and that is why this is this is shown in the red color; because it is derived or it is taking from the LEED.

There is also a large area under the influence of BREEAM, we have CASBEE, here we have Green Star which is predominantly working in the countries of Australia and New Zealand and likewise.

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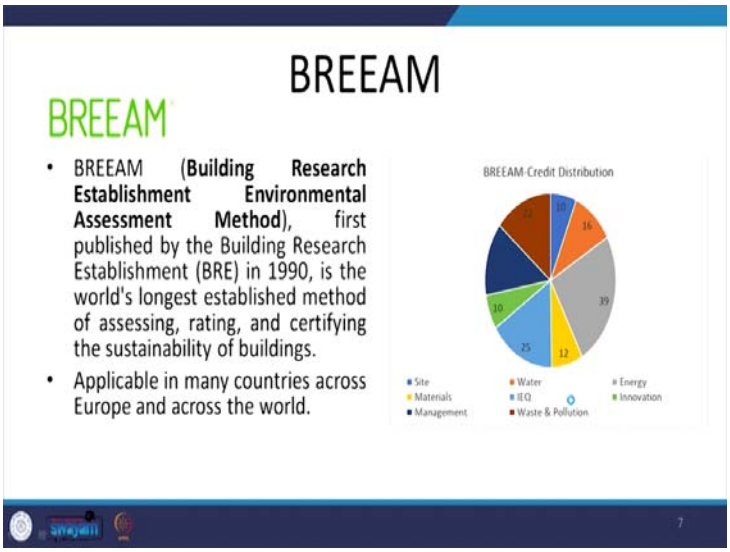

So, we have all these rating programs and almost the entire world is going ahead with this green building movement almost all the countries now have their green building councils and their own rating programs at least one or the other rating program is being used in the countries. Let us quickly go over each of these rating programs very quickly and see the emphasis which is being placed on different green building components, the broad categories which the first slide of today's presentation showed.

So, BREEAM is the oldest one and it started from UK and in 1990 as we just saw. And now, it is applicable in almost the entire Europe and many other countries across the world. If you look at the credit distribution in BREEAM we can see very clearly that the largest percentage of credit is taken up by the energy indicator energy a component and a large percentage of it also goes towards the waste and materials together, which I can place together as resources materials and resources.

So, that is together, quite a significant percentage is also going towards site, there is some proportion for innovation as well and a reasonably significant part for management. So, it is quite a diverse thing diverse a distribution of the credits, but this is the most recent version, when any of the rating system when it was initially started did not start with the same distribution. These distributions have been changing from country to country from rating program to rating program.

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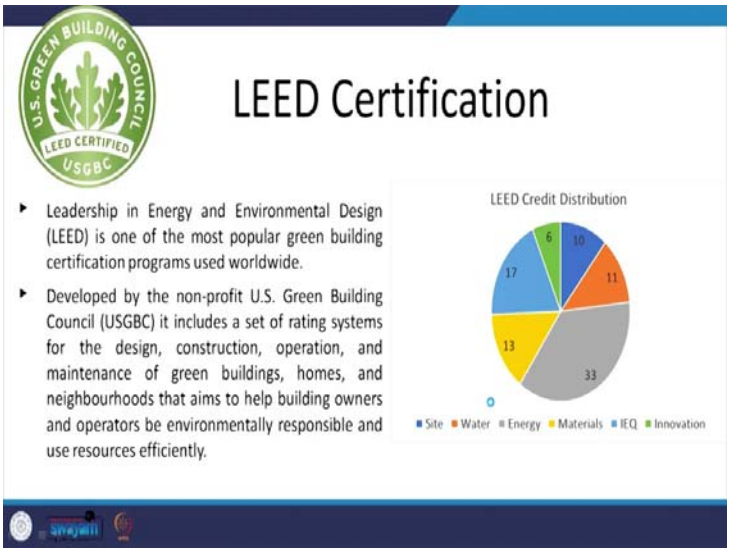

LEED is very popular it was developed by USGBC. And if we look at the credit distribution under LEED we can see that a very large percentage is actually going towards energy which is 33 percent one third of the total credits are actually earned if we focus on energy and then a large percentage for materials, water and indoor environment quality so, these 3 are also placed quite high. There is some credit for innovation, but not as much and some credit to site as well so, the highest is energy again.

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If you look at the LEED certification level, the buildings are certified and once the buildings are certified they are given certification level as platinum certified or gold certified or silver certified or just certified. So, platinum is highest and the total maximum points that a building can earn is 110 points. So, from 80 and above it is platinum certified which is often very difficult to achieve and lesser than that is gold at 60 to 79 points and then silver from 50 to 59. So, with it is this one is for LEED, but we have this kind of certification level for all different rating programs.

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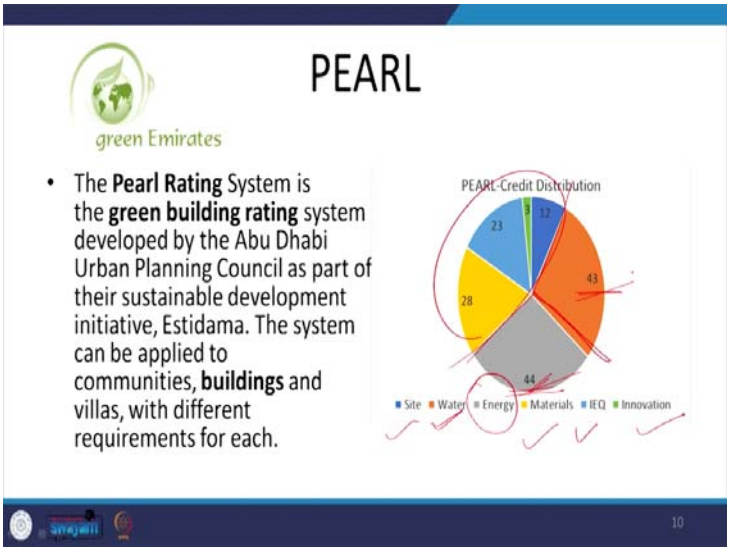

So, Pearl Rating Program is for Dubai and Abu Dhabi and it was developed as part of by Abu Dhabi Urban Planning Council as part of their sustainable development initiative. Here, energy is even higher it is closing in to around 50 percent 44 percent precisely and water, which makes a lot of sense because Abu Dhabi and the Middle East is a very dry region very dry area. So, very high emphasis is placed on water, so far, we have seen that no other rating program has placed as much importance to water as this particular program and this is this is quite high.

So, total 44 credits not is not a percentage, but 44 credits approximately 30 percent is for energy and 30 percent is for water and the rest 30 percent approximately is taking into account materials, indoor environment quality, site and innovation all. So, this is a very high number which we are seeing as well and that is the intent of this discussion where we see that different rating programs have different emphasis points.

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Green Star is applicable in Australia and New Zealand and in it assesses the sustainable design, construction and operation of buildings, fit outs and also communities. Here again we see that a lot of emphasis is on energy and there is greater emphasis on materials and resources just like BREEAM as compared to water, innovation, site and management.

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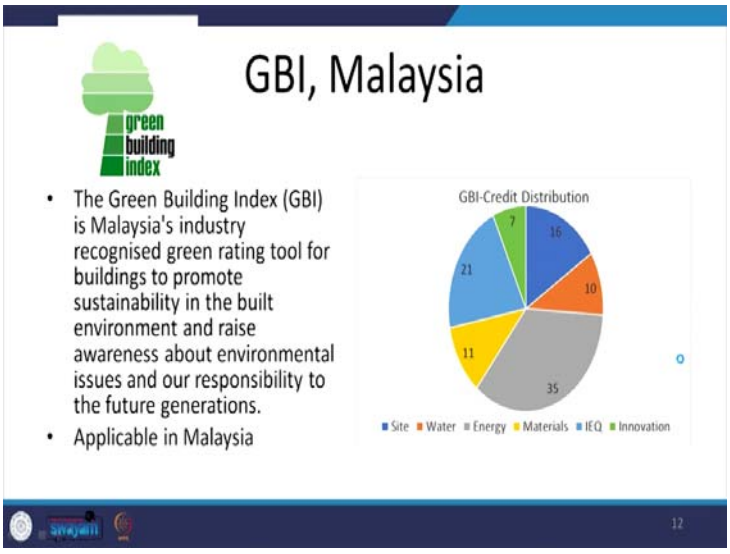

So, if we look at the individual components energy and material, they are given greater importance. If you look at GBI Malaysia, which is applicable in Malaysia we again see a

greater emphasis on energy. So, commonly we see that almost all the rating programs are placing greater emphasis on energy which also highlights the fact that energy crisis is there, we have less of energy, our energy demand is going on going on increasing while our supply is still limited we still have limited supply of energy resources.

Hence, the green buildings must address the energy parameter the energy component all other components are still lower, but here in GBI Malaysia we see a lot of emphasis being placed on IEQ Indoor Environment Quality; which is also unlike other green building rating programs. So, a lot of emphasis is placed on indoor environment quality.

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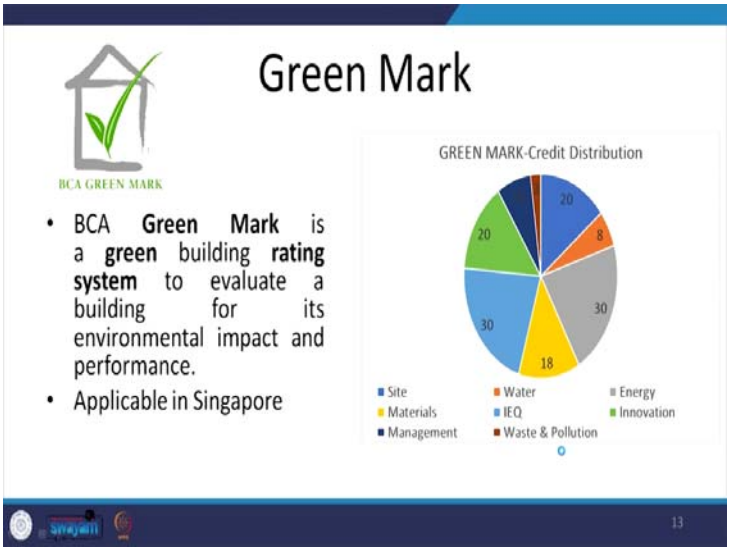

So, this comparison between rating programs can lead us to very interesting findings as to what is the common trend where the world is placing emphasis on and then the regional variations within these.

Now, this BCA green mark is the rating system which is applicable in Singapore. And we see again that a lot of emphasis on energy and indoor environment quality is being placed. We also see that a lot of emphasis on innovation and sight is being placed here, but very surprisingly not much of emphasis is on water while there is a lot of crisis water crisis in Singapore.

Now that could also be due to the national policies where, water is be maintained managed and treated at the national level at the at the large scale and not at the building

level. So, probably very less percentage here waste for so, the reflection of this green building rating system and the weightage to each component also reflects the national policies which are in place. So, where is the government wanting to place focus through the individual buildings towards improving the environment.

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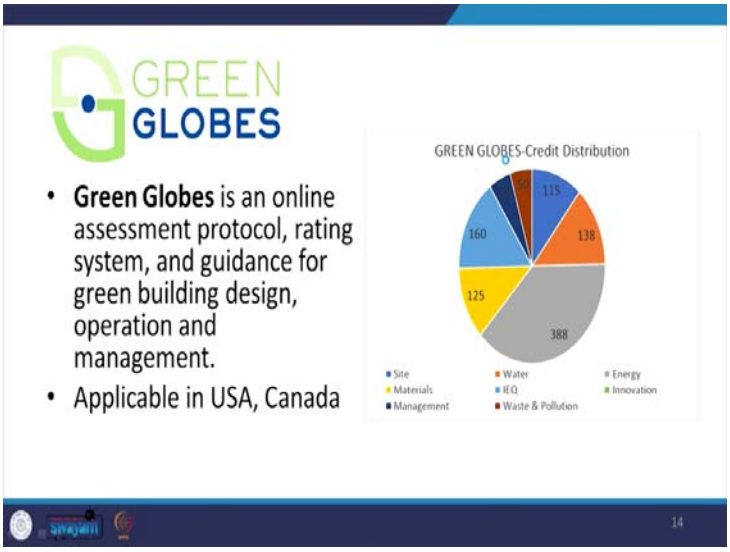

This Green Globes is applicable in US and Canada and we see that very large share is given to energy again; energy, water and materials and also indoor environment quality. So, rest of the three-site waste and management they fare very low. So, energy uniformly somehow is very high on the agenda.

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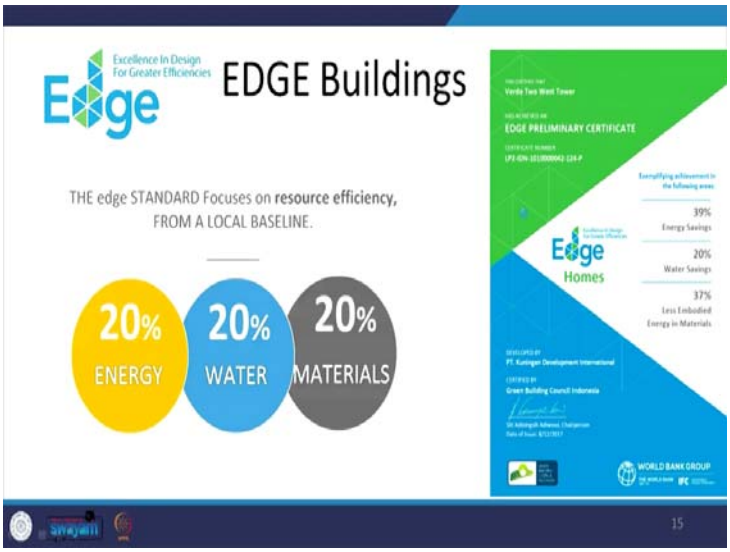

This is EDGE Buildings; the Edge is very different from the rest of the rating programs it is a rating program, but it does not evaluate the site the indoor environment quality, the innovation, management none of those and it evaluates any building only on three basic criteria which is energy, water and materials. It does not give any star rating or any certification like that; it will only focus on the reduction in the consumption of energy, water and materials from the local baseline.

So, Edge is applicable for the entire world and if I have a building in India so, the baseline is from the Indian codes for example, ECBC maybe for use for energy, for water, we may have specific codes for materials, we may have NBC and so on. So, only these three criteria where the minimum is 20 percent reduction has to be achieved from the baseline and that is what will enable you to have a certificate to the building which is certified by edge, this was an overview of the rating systems from the world.

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Now, if we look at the Green Building Rating System which are prevalent in India.

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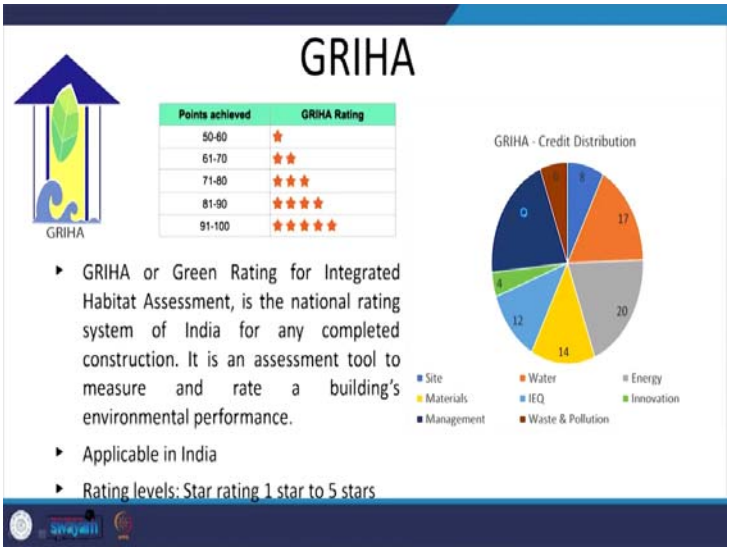

GRIHA is our indigenous rating program which was developed by TERI and it is adopted by the government of India. So, all the government of India buildings, public buildings are supposed to be certified using GRIHA rating program and the rating which is given by GRIHA is a star rating. So, from 1 star to 5 star the maximum number of points that we can achieve is 100 which will help us to fetch a 5-star rating in GRIHA

which is again a very tough job. And with minimum 50 percent of points earned we can actually have a single star agree high rated building.

GRIHA is very much suited for Indian context because it places it emphasizes on the local needs of our country. We see that there is an there is a focus on energy, but more than energy, we have a larger focus on management where some of the indicators which are not discussed in any other rating program are seen. For example, providing basic amenities and healthy living conditions for the workers construction workers is incorporated. Providing basic amenities like toilets and living quarters, creche for their children is all part of GRIHA rating program.

Now this is beyond green and it is taking it towards a sustainable building level where we are concerned about our workforce, besides the regular point this is a unique point about GRIHA. In other points there is there are parameters like water, materials, site which are given emphasis and some on waste and pollution, innovation and indoor environment quality. So, all these are also a there in GRIHA.

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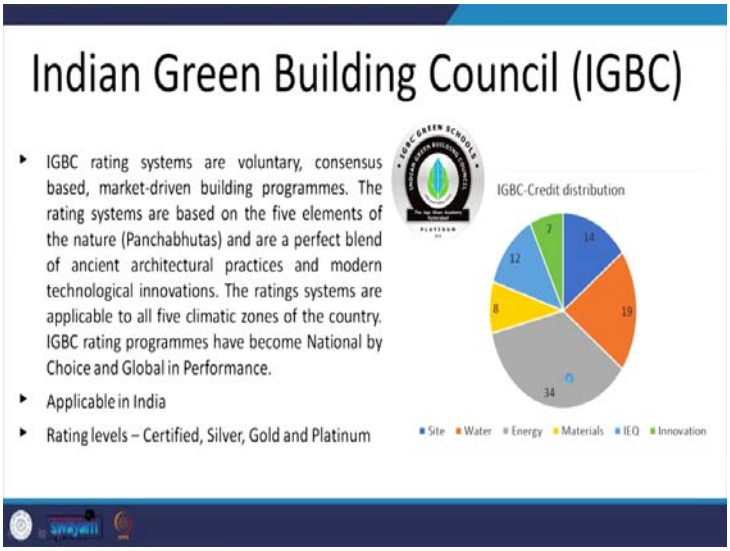

On the same lines as we have discussed LEED, we have our Indian Green Building Council, IGBC which was formed with the help of USGBC they helped form IGBC in India and gradually IGBC has developed on it is own. So, it started the first rating program of IGBC was IGBC new construction initially, through IGBC we were practicing LEED in India. So, the first green building in India was actually LEED

certified building. And gradually, IGBC has developed a lot of rating programs for different types of buildings, different types of built environment within India.

If you look at the credit distribution again for the new construction, we see a lot of it is very similar to what we find in LEED. So, a lot of emphasis on energy and water and then site, indoor environment quality, there is emphasis on materials and innovation very similar to what we had in LEED but gradually we have moved on.

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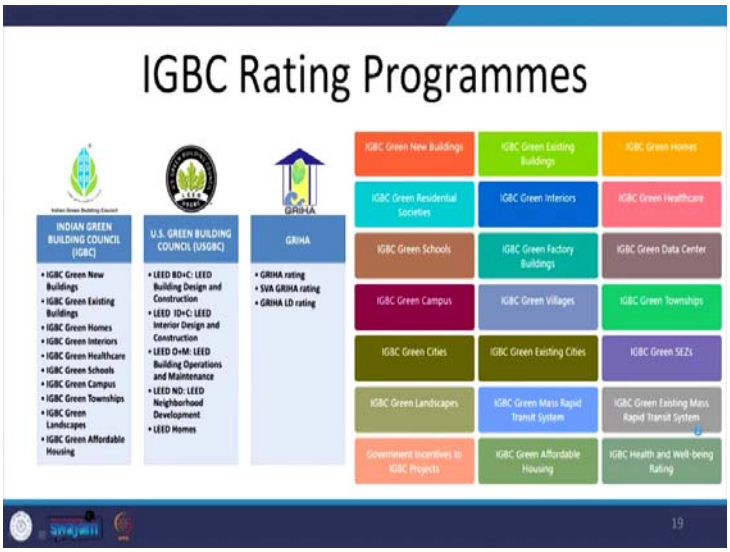

And IGBC today has more than 20 rating programs for our country, which is largely applicable to our country. Now, starting from new buildings existing buildings they diversified to green homes. So, a house within that the kind of housing projects it could be apartment, it could be residential society, it could be individual home which can go and get themselves certified. Then they have for townships, they have for green villages campuses, educational campuses like ours, cities, bigger cities, very large cities also have this rating program which is applicable.

Then for landscapes, affordable housing, health and well being, there is one for interiors, for factories, schools, data center, health care, SEZ, existing cities, MRTS; almost a variety of built environment is covered through different rating programs of IGBC. If we are going ahead for designing any built environment which is certified we need to look at these rating programs and use the appropriate one for the kind of development we are intending to undertake. In addition to these two which is GRIHA and IGBC rating

programs we have our national building code. And very recently a new chapter new part which is approach to sustainability was added to national building code.

As and this step has mainstreamed, the sustainability the discussion about sustainability in the building's arena. So, far the rating programs which are voluntary in nature were being used to develop and design green buildings. Now on the code, NBC is not a mandatory code it is a voluntary code, but yet it very clearly states the procedure, the benchmarks, the guidelines for designing sustainable buildings.

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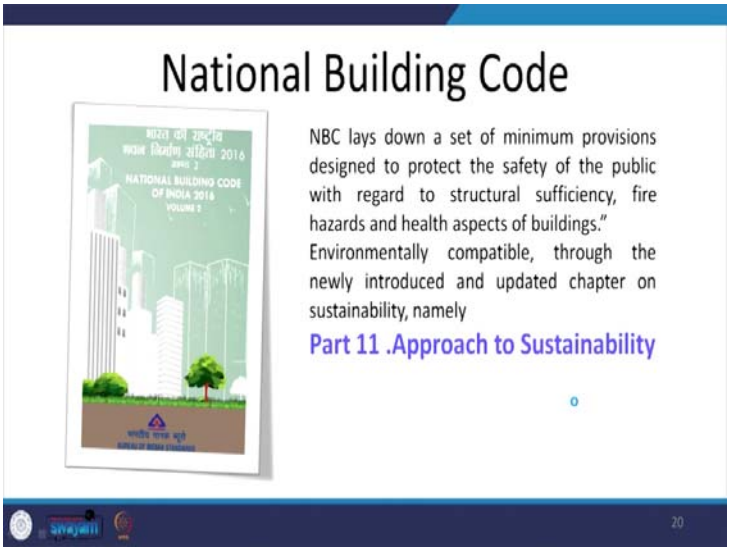

So, this part 11 approach to sustainability clearly outlines the criteria for designing and constructing sustainable buildings.

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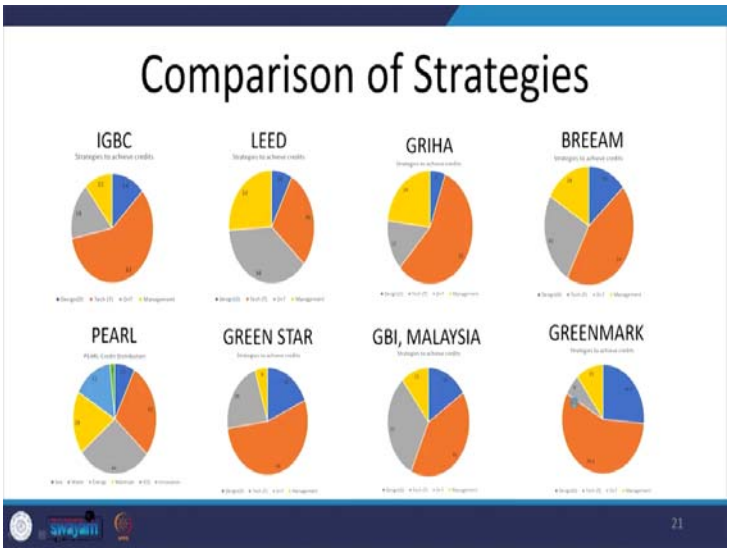

If you do a quick comparison of strategies of various rating programs successful popular rating programs. We can see that these strategies for achieving this green building certification through different indicators, it may be achieved through different strategies, there may be design strategies where we design the building in such a manner that it qualifies for a certain criteria.

For example, orienting the building correctly may result in energy reduction, reduction in energy consumption. So, that is a design-based indicator design-based criteria. There are certain indicators criteria which are met by deployment of advanced technology. For example, reduction in energy consumption through the use of high efficiency equipment; for example, the lighting fixtures which are going to be used are very high efficacy fixtures.

So, they will help us in reducing the energy consumption same is for water. So, we might have certain indicators which may be achieved with the help of advanced technology. We may have indicators which can be fulfilled through a combination of design and technology both. So, with design and then we can either we can design or we can use technology to achieve a particular indicator and the last one is management.

So, how the building is being operated, during construction how it is being managed how the waste is being managed, post occupancy how the building is being managed. So, if we look at the comparison of strategies, we see that across the world different green

building rating programs place a greater emphasis on the technology. So, a lot of technological strategies technology-based strategies are used to certify and design and have high performance green buildings. However, through a course on sustainable architecture, we advocate and we suggest that the first step should be to design the buildings correctly.

So, a larger emphasis focus on designing the buildings correctly passively and then move on to complement them with the advanced technology to improve the performance. Now besides these which is which is the ongoing trend there are new trends and mega trends. So, from green buildings certified green buildings we are now moving on to energy efficient buildings and net zero energy buildings.

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So, the world is not talking not only about buildings which consume optimum amount of energy slightly less amount of energy; we are talking about buildings which consume no energy at all or whatever energy they consume they are able to generate. So, no energy is being taken from the grid, this is net zero energy buildings, there are net zero water buildings, there are buildings which are just net zero.

So, we are talking about the existing buildings, we are talking about cloud as IOT becomes popular, we are talking about incorporating all these things into our buildings, we are talking through cloud, we are talking about performance disclosure, we are only

talking about healthy buildings. So, these are different trends we are talking about solar power where renewable energy incorporation into built environment is being looked at.

And all these different trends are also being captured through different rating programs. So, so far what we have seen is, different green building rating programs which cover more or less the same types of components and parameters. Now couple of rating programs if we will see focus only on one of these megatrends, unlike the green building trend movement. So, if we start from India there is this ECBC Energy Conservation Building Code and they star rating for buildings which focuses only on the energy performance of the building.

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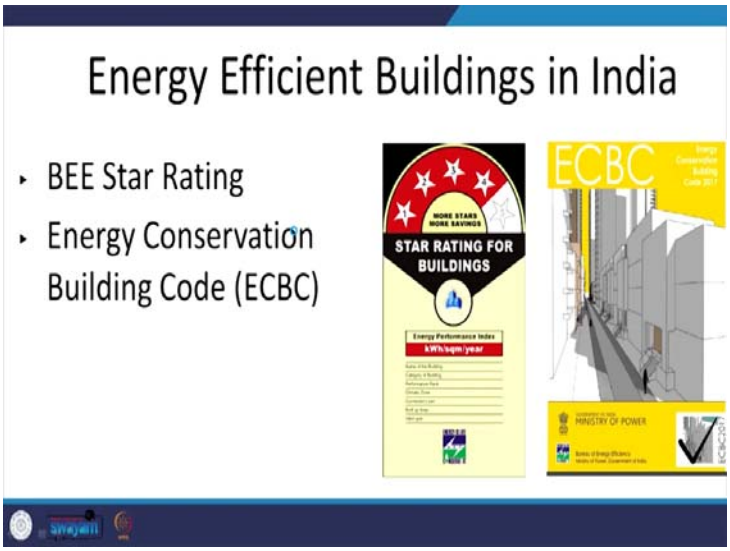

So, we have ECBC Energy Conservation Building Code for commercial buildings and a new one ECBCR is also out which is for residential buildings. On the basis of the performance which is specified through ECBC we have this green star rating program for buildings where the EPI for each type of there are different categories of buildings. For example, hospital buildings are there, there are hotel buildings, commercial buildings and the EPI for each building in different climates is specified. So, this is specific to energy performance of the buildings.

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There is another certification which is Well Standard, Well Building Standard and the larger focus of well building standard is on health well being and in and quality. So, there is no discussion on how the site is being developed what kind of materials are being used if the materials have a focus on the quality of air, the comfort, the light, nourishment. So, this is largely focusing on the health, well being, an indoor environment quality. So, there is specific focus on these dimensions.

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There is GRESB which assesses the Environmental, Social and Governance performance of the real estate. So, we are not really looking at individual building, but we are looking at the infrastructure, we are looking at the real estate and a larger portfolio as such when we are looking at the GRESB certification and this one is largely used by developers, large developer groups. There is SITES Sustainable SITES Initiative which is again looking at the sustainable and resilient land development projects sites certification.

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We also have PEER which is largely looking at the renewable energy incorporation into the existing programs. So, when we are talking about sustainable buildings and then focusing onto green buildings there is further diversification, there is further focus which is being placed on different aspects of sustainable buildings or green buildings.

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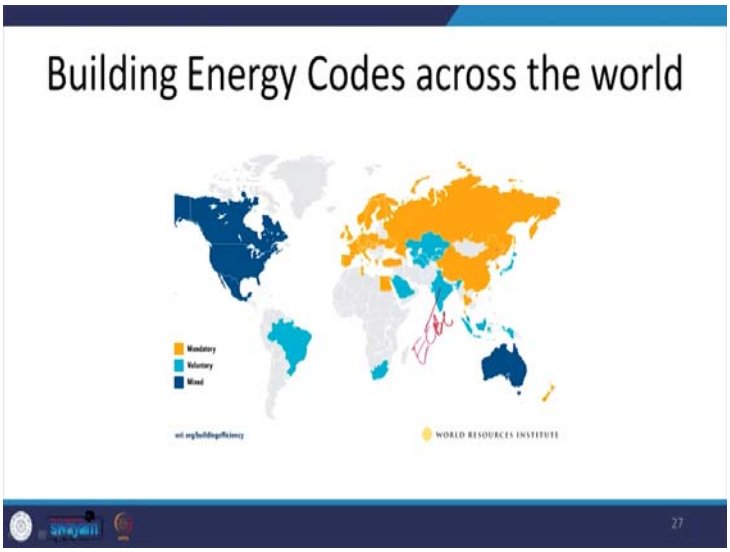

If we look at this global map, we can see that energy codes are being implemented they are being developed for different parts of the world; for example, what we just discussed about is ECBC which is for India that is the energy code for India. So, we have ECBC in India, for rest of the world also there are different codes energy codes which are being developed, some are mandated, some are involuntary staged.

For example, in our own country, some are in mixed stages of implementation partly mandatory partly voluntary. In some cases, in our case for example, GRIHA is mandated for public buildings, but that is the green building rating program, but for energy codes also this is the same scenario.

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So, to consolidate it all the rating programs which are as on date applicable in India are GRIHA, IGBC rating programs, LEED from USGBC, Edge, we have ECBC which is a code which is also being implemented through star rating programs of BEE and we have well building program.

So, I will conclude my lecture today, with this discussion on green building rating programs and the components. In the next lecture onwards, we will go on to elaborate the process of designing green buildings taking from the previous lecture and taking it to the next level where we detail out, how to design how to implement that process. Thank you for joining us, see you in the next lecture.

Thank you.