

Webinar Panelists

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Sean Esterly

Hello everyone. I'm Sean Esterly with the National Renewable Energy Laboratory and welcome to today's webinar hosted by the Clean Energy Solutions Center. We are very fortunate to have Didier Houssin, Yamina Saheb, Benoit Lebot, and Marcel Alers joining us. This outstanding group of panelists will be discussing the newly released publication "Modernizing Building Energy Codes to Secure our Global Energy Future." One important note of mention before we begin our presentation is that the Clean Energy Solutions Center does not endorse or recommend specific products or services. Information provided in this webinar is featured in the Solutions Center's resource library as one of many best practices resources reviewed and selected by technical experts. Before we begin, I'll quickly go over some of the webinar features. For audio, you have two options. You may either listen through your computer or over your telephone. If you choose to listen to your computer, please select the "mic and speakers" option in the audio pane. By doing so, we will eliminate the possibility of feedback and echo. If you select the telephone option, a box on the right side will display the telephone number and audio PIN you should use to dial in and all the panelists, we ask that you please mute your audio device while you are not presenting. If you have technical difficulties with the webinar, you may contact GoToWebinars Help Desk at 888-259-3826.

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and contributing to the environmental sustainability. Before our speakers begin their presentations, I want to provide a short informative overview of the Clean Energy Solutions Center initiative and then, following the presentations, we'll have a question and answer session where we'll be able to address some of the questions that you've sent in and wrap up with the discussion and closing remarks.

So, this slide provides a bit of background in terms of how the Solutions Center came to be. The Solutions Center is an initiative of the Clean Energy Ministerial and then supported through a partnership with UN Energy. It was launched in April 2011 and is primarily led by Australia, the United States, and other CEM partners. Outcomes of that unique relationship support of developing countries through enhancement of resources on policies relating to energy access, no-cost expert policy assistance, and peer-to-peer learning and training tools such as the webinar you are attending today.

So, the Solutions Center has four primary goals. It serves as a clearinghouse of clean energy policy resources. It also serves the share policy best practices, data, and analysis tools specific to clean energy policies and programs. The Solutions Center delivers dynamic services that enable expert assistance, learning, and peer-to-peer sharing of experiences. Then, lastly, the center fosters dialogue on emerging policy issues and innovation around the globe. Our primary audience is energy policy makers and analysts in governments and technical organizations in all countries. We also strive to engage with the private sector, NGOs, and civil society. A more key feature that the Solutions Center provides is expert policy assistance. It's the "Ask an Expert" and it's a valuable offered through the Solutions Center. We have established a broad team of over thirty experts from around the globe who are available to provide remote policy advice and analysis to all countries at no cost. In the areas of sustainable buildings, we are very pleased to have Cesar Treviño, leader of the Mexico Green Building Council and representatives from the Climate Works Global Building Performance Networks serving as our experts. If you have a need for policy assistance on sustainable buildings or any other clean energy sector, we encourage you to use this useful service. Again, this assistance is provided free of charge. For request assistance, you may submit your request by registering to your Ask an Expert feature at cleanenergysolutions.org/expert. We also invite you to spread the word about this service to those in your networks and organizations. We encourage you to explore and take advantage of the Solutions Center resources and services including the expert policy assistance, subscribe to our newsletter, and participate in webinars.

Now, I'd like to provide brief introductions of our distinguished panelists. First up is Didier Houssin, director of Sustainable Energy Policy and Technology at the International Energy Agency. Didier will be providing introductions in discussing why buildings matter. Following Didier is Dr. Yamina Saheb who will describe the evolution of building energy codes

over time as well as policy pathways for making effective building energy codes. Dr. Yamina Saheb is the head of the Sustainable Building Center at the IEA. Following Yamina, we will hear from Benoit Lebot, a technical advisor on climate change mitigation and adoption for the United Nations Development Program. Benoit will present on challenges at the design and implementation stages and finally, we will hear from Marcel Alers who is the global head of Energy, Infrastructure, Transport, and Technology team at the United Nations Development Program. Marcel will provide concluding remarks and with those introductions, I'd like to welcome Didier to the webinar.

Didier Houssin

Thank you very much Sean and good morning or good afternoon everyone. I'd like to welcome all of you to this launch webinar of the policy pathway on Modernizing Building Energy Codes to Secure our Global Energy Future. This is a joint publication of the IEA and UNDP. It has been gratefully supported financially by the Japanese Meiji and the German Ministry of Economics and Technology and I'd like also to point out that several organizations have provided in-time contributions to this work. Next slide, please.

The IEA has, for a long time, identified building energy codes as the key policy instrument to improve energy efficiency of buildings and as you can see on the screen, it is one of our key recommendations among the twenty-five energy efficiency policy recommendations that the IEA has established. The IEA and UNDP have partnered for this work. The objective is to analyze current practices in the design and implementation of building energy codes. The aim is to consolidate existing efforts and to highlight the importance of the built environment in the low carbon and climate-resilient world. The IEA relies on forty years of experience in the design and implementation of building energy codes to its member countries while UNDP has over twenty years of experience in data and information from across the world to provide technical support and policy advice to non-IEA countries. The IEA and UNDP decided to work together on this joint policy pathway because sharing lessons learned between various countries is critical to spreading best practices, improving energy security, and contributing to environmental sustainability at global level. Next slide, please.

The building sectors final energy consumption has doubled between 1971 and 2010 to reach two thousand eight hundred million tons of oil equivalence driven by population increase and economic growth worldwide. Under the current policies, global energy demand from buildings is suggested to grow by an additional eight hundred thirty-eight million tons of oil equivalence by 2035 compared to 2010. This is equivalent to the current energy demand of the building sector in the US and China combined and most of this growth will result from the increase in building energy use in non-IEA countries. In most of these countries, buildings currently account—in IEA countries, I mean, buildings currently account for more than forty percent of the primary energy consumption.

The residential subsector remains the largest consumer of energy at global level and the nonresidential subsector has increased its share since 1990 especially under large emerging economies. Next slide, please.

Improving the energy performance of the building sector is crucial to ensuring long-term global energy security and reducing energy expenditures. Growing energy consumption of buildings is expected to exert heavy pressure on the global primary energy supply and less effective policy action is taken. This relationship is illustrated on the slide by the dynamics of gas consumption in IEA member countries. Natural gas is the main energy carrier, which is used for heating in IEA countries. In 2010, gas consumed by buildings accounted for fifty-eight percent of total final gas consumption. Gas imports have a significant impact on the balance of trade of most IEA countries. For instance, at EU level, total gas trade deficit represented more than forty percent of the total trade deficit with the rest of the world in 2010. In non-IEA countries, the buildings energy mix still consists predominantly of traditional biomass, which has serious consequences on health and environment, but globally and physically for IEA countries, addressing increasing gas consumption of the building sector would have a very positive impact in terms of energy security. Next, please.

The building sector is also a key component of the global economy. It accounted for eight percent of global GDP in 2010 and in most IEA countries where the building's renewal rate is less than one percent, the building sector will also continue to play a major economic role if ambitious energy renovation plans are developed and implemented. Such plans would engage various market actors in a green growth strategy and contribute very significantly to job creation. Such plans would also boost innovation, enhance competitiveness, and create new business opportunities for local industry. Ambitious renovation plans would also increase government's income through direct and indirect taxation and this, for a long time as the net employment affect the buildings energy renovation, lasts for several decades. Energy renovation of existing buildings will reduce household energy expenditures, which in 2010 represented more than three percent of GDP in Germany and in Slovak Republic as you can see on the charts and more than two percent in most other IEA member countries. In the US, cost-effective energy or retrofits could save consumers thirty-two to sixty-four billion dollars a year in energy cost or three hundred to a thousand two hundred dollars a year for each individual family on average. Next slide, please.

The building sector is also at the heart of the climate challenges. Because of the extensive use of fossil fuels, the building sector is currently a large contributor to CO₂ emissions at global level. Of course, CO₂ emissions vary per country as you can see on the chart according to climate conditions and according to the age of the building stocks and the energy carrier, which they have used to provide energy services. As you can see Europe with its cool climate and aging building stock has the highest CO₂

emissions for the overall building stock; however, CO2 emissions per capita in the EU are lower for instance than in the US because of the smaller size of home. The transformation of the building sector to low-energy buildings with reduced energy consumption and by expansion-related greenhouse gas emissions and contributes to leaving—to helping to delay the lack in CO2-emitting infrastructure and thus, leaving the door open to a two-degree Celsius climate scenario. It would also reduce the intensity of extreme weather conditions and their impact on public life and health. To address the variety of challenges due to the building sector, policy action is needed to curtail work in energy consumption of the global building stocks and building energy codes has been identified as one of the key policy instrument to meet these objectives. To grow more in detail about energy codes, I'd like now to hand over to Yamina who will take us to the best practices identified in the design and implementation of building energy codes.

Dr. Yamina Saheb

Thank you Didier. Hello everyone. Building energy codes is the policy instrument implemented in IEA countries just after the oil crisis to tackle the energy consumption of their building stock. At the time, in the seventies, we didn't have the knowledge that we have now on building science and computer engineering so building energy codes were basically prescriptive. This means that we were setting energy requirements for each building components individually. I mean for walls and for windows and later on, for heating and cooling equipment and trade-off had been allowed. This is the simplest way to set minimum energy performance requirements for the built environment; however, it's also the most risky way to set minimum energy performance requirement because this approach doesn't allow to take into account the interactions between different building components and equipment, which may lead to lock the savings potential for several details. In the nineties, with the progress made in building size and computer engineering, IEA countries and some of BRICS countries moved from prescriptive codes to model codes. What do we mean by model codes? It's that we can model the overall energy consumption of the buildings—of each building individually considering the components and the equipments that we are going to use. This approach has introduced and improved the performance of the built environment; however, in this approach, the energy performance or climate of buildings is relative to the reference building itself. In practice, this means that we cannot set baselines when we use this approach and in practice also, small buildings are penalized by this approach. More recently, five or six years ago, some of the IEA countries moved from the model codes to overall performance code setting minimum energy performance on this value for each building site in each climate zone. With this approach, we can set baselines and we don't penalize any more small buildings. Next slide, please.

So, this approach is based on holistic design of the buildings, but this is the best set or the first best practice that we have been able to identify to set minimum energy performance requirements for the overall buildings in

a holistic way; however, the next step that it considers the OID infused or being caught only is to follow the path that we described here to low energy buildings and these types consist three different strategies. First, we reduce the energy needs. To reduce the energy needs, we have to implement minimum energy requirements from the energy sufficiency measures. By energy sufficiency measures, we meet, for examples, requirements from bioclimatic designs principles and to do that, you'll see here in the second rule that you need to go here beyond building energy codes and to consider land use policies to be able to implement bioclimatic design principles. The second step is energy performance requirement for the overall buildings and in addition to that for each building equipments and components. This is where most of the building codes are. The third step is to supply with—to make it mandatory to supply with renewable energy sources and the renewable energy could be provided either from the building itself or from the neighborhood of the building. Next slide, please.

To be able to make—to increase the stringency of energy requirements of building energy codes, it's really important to adopt building energy codes to the lifetime of the buildings. We know that buildings last long in most countries, more than centuries in EU countries for example. That's why we need the long-term perspective and the long economic and energy security perspective loads up to consider low discounts rate and this is the only way to be able, when we look at it from the macroeconomics perspective, to make energy requirements more stringent. Next slide, please.

Why the economic—long-term macroeconomic perspective is needed because as you see here—look at the blue bar, the light blue bar. You see that the building stocks, this is from the residential sector in IEA countries at best if you'll renovate it every forty years. In practice, we know that it's less than forty years in most countries. So, that's why if we need the opportunity to have the fourth—when performing overall, this means that at best, we will have these opportunities again forty years later and then, the second step is of course cooling and heating equipments that we need to have an efficient as possible using the best available technologies in our market and the last step is to have the most efficient lighting and appliance product. Why this is the last step because, usually, lighting and appliance products as you see here are new every—for appliances, every three to five years and for lighting, less than that. Next slide, please.

Now, in terms of the coverage—worldwide coverage of building energy codes, most countries or I could say all countries over the world, when they start designing their building energy codes, they first target new residential buildings. Then, they move to new nonresidential buildings. Why? Because it's easier to implement energy requirements in new buildings than in existing ones because we have to wait until they are renovated. We don't have yet any country where the renovation is mandatory, at least the energy renovation and then, for the last fifteen

years, we have seen in IEA countries and some of the BRICS countries implementation of building energy codes for existing buildings when they are renovated or when they did an alteration of the building. What you see in this map is the worldwide coverage of building energy codes based on—if the code is implemented on mandatory basis, these are the green—the countries showed in green or when it's mixed mandatory and voluntary and where building energy codes do not exist at all, these are the countries showed in grey. When we see that, we may think that all the countries that are in green, they have no more work to do. In practice, it's not the case because in all the countries, we need to make sure that compliance—we check compliance to building energy codes in the sea. Unfortunately, compliance data do not exist so we cannot assess how effectively codes are implemented even in IEA countries. Next slide, please.

After an extensive research and analysis of building energy codes in IEA and non-IEA countries, we have been able to design this pathway for effective and successful building energy codes. It includes all IEA policy pathway four steps—four phases, sorry, and for each phase, we included series of steps and actions for governments to follow and we provided some tips based on the practices already implemented in different countries. The steps designed here—the steps that you will be able to read in a few minutes in the publication are not—may not be simple for everyone because policy makers, they placed in practice a variety of challenges in the design and in the implementation of building energy codes. I leave it to Benoit Lebot from UNDP to give us an overview of the main challenges that come to each phase and how they overcome them. Thank you.

Benoit Lebot

Good day everyone. I hope you can all hear me well. My name is Benoit Lebot from the United Nations Development Program. I am based in the regional center in Dakar, Senegal. As you may know, UNDP's main mission is to support human and economic developments in developing countries and economies in transition. Engaging in low carbon and climate-resilient developing parts is absolutely essential in today's world. As we just heard, buildings represent the very important and sometimes, the growing carbon footprints for both developed and developing countries. For as such UNDP understanding, what are the good practices to promote energy efficiency in the building sector is key; hence, this collaboration with the IEA's secretariat to draw the lessons of promoting energy efficiency in the building sector from the rich world. This graph illustrates the evolution between 1990 in green and 2009 in orange of the energy consumption of the building stocks in various IEA member countries. As we can see, overall, the energy consumption of the buildings has decreased in 2009 compared to what it was in 1990 despite the stock increase. This is the result of the successful implementation of building energy codes. Building energy codes deliver when they're effectively implemented, regularly effected, and well enforced. The blue line shows where the consumption of building stocks should be or could be in 2015

with no technology if countries succeed in moving to a low-carbon pathway compatible with maximum two-degree global warming. This gives us a direction to go and this indicates that there's still room for improvement and this includes new programs and new policies to be implemented in the building sector, not only the new building, but also on existing construction. The first message for us at the UNDP is that a similar chart cannot be drawn today for non-IEA member countries. The reasons are simple. There is a lack of data, there is a lack of baseline information, and there is low interest in capacity to address energy efficiency in the building sector. Next slide, please.

UNDP approaches to provide policy, technical and financial support to governments for the implementation of basic policy practice. Building capacity is one of UNDP's main roles in developing countries for encouraging a low-carbon development, identifying the buyers to the promotion of energy efficiency, and to develop activity to remove each of these buyers is our main approach. Our second buyer that we have identified for this work for promoting energy efficiency in the building is the fragmentation of the building sector. This is illustrated in the drawing on the right—on the left side. The building sector is comprised of wide diversity of players ranking from national government to local government from building owners to building occupants with their specific industry and a series of experts. So, this is another lesson that we draw from UNDP member countries. It's the importance and the benefits to involve the stakeholders at the early stage of the planning phase of any program to promote energy efficiency in buildings. An effective and continuous coordination between government bodies and market players is the way we think we can address this fragmentation. The third challenge when designing building energy code is the alignment of energy requirement with other policy instruments typically, land use planning with also climate change policies both adaptation and mitigation and of course, energy efficiency action plans, energy security policy, and economic policies. We can think here about removing subsidies on some fossil energy that greatly contribute to promote—to create the commission for enhancing energy financing the building sector. On the right part of the graph, you see the routine scheme that has been introduced in one of our project in Tunisia, a project financed under the global environment facility. The energy level was first developed to transform the markets of appliances, but the same level is now being used to introduce minimum energy efficiency requirement for buildings. We believe that the redundancy between energy efficiency policies does not only pay. It also helps the general public and the policy makers to better mainstream energy efficiency into the decision process. Next slide, please.

Of course, one of the major difficulties of any building codes like any policy is the implementation. Policy makers from all over the world face a challenge of compliance checking. This graph illustrates the various blocks to help the government in the process of compliance and enforcement of building energy codes. Without a robust compliance

mechanism, codes like any other public policy can lose its credibility; hence, the importance of setting compliance mechanism with full understanding of the sanctions and requirements. The sanctions in question have to be strict enough to discourage this noncompliance and of course, compliance should be assessed regularly during the design, the construction stage, and also, at the level when the buildings are occupied finally by the occupants. The lack of compliance checking is usually due to lack of finance and lack of expertise. Next slide, please.

One way to overcome the challenge described above, the lack of capacity, the lack of understanding, the lack of know-how on to build energy-efficient buildings, can be overcome through demonstration projects. So, it is very common in our project that we promote before and to help defining energy efficiency building codes. We developed some project demonstration project. Demonstration project consists in the design of pilot buildings where we include the energy efficiency measure considering the building codes. Demonstration project represents the unique opportunity to develop the baseline information the same as the data that we need. The energy consumption, the cost of the energy efficiency measures, the performance characterized by local consumption method, and so forth. This is also a way to develop a training material for the market sectors that we've been charged of the implementation of the building codes. The new IEA-UNDP publication policy pathway contains different illustrations of the demonstration project and the different programs that UNDP has led in developing countries. Thank you very much for your attention and now, next slide for Marcel Alers.

Marcel Alers

Yes, thank you Benoit. On this slide, you'll see a map of the world and in blue are the countries that—in which UNDP is currently or has been working with the countries to help them put in place energy efficiency building codes—building energy codes. Now, the important point here, which I would like to draw your attention to, is the countries that are not blue, which as you can see is most countries. Really, there are big gaps in Africa, Latin America, parts of Asia where there is nothing yet. So, this is key to understand and in spite of all the work that has been done, there still remains a lot of countries to be covered, about three-fourths of the countries around the world. Now, in doing that, it's very important that we consider and take into account the readiness of countries to undertake certain types of projects. Building energy codes are after all fairly sophisticated instruments that are not all that easy to pull together. Designing them is one thing, but as has been mentioned before, you still have to implement them before they can have any impact and that's really difficult. So, in going about helping new countries and this is what UNDP obviously typically does with our mandate to developing countries to try to learn from what we have learned in, for example, the developed world like the IEA and countries and transfer this knowledge and try to apply it to these new countries. So, in those cases where countries are not fully ready yet perhaps to embark on full flash building energy codes, it may be necessary to engage with pre-capacity building if you like to get them up

to the level required and we can tailor our projects to the conditions or the situations in a particular country. Next slide, please.

Now, on this slide, I would like to give a brief overview with some web addresses and links to several initiatives—international initiatives that are being—you know, that are ongoing and are focused on energy efficiency and buildings. The importance of the building sector in reducing pressure on energy supply and the impact of climate change as we heard is now well recognized at the international level. We're not telling anything new anymore. So, apart from all the work that UNDP and several of the other agencies—international agencies are doing principally with help from the global environment facility, there's a number of other things going on. First is the IEA sustainable building center, which has been created and established with funding from the German Ministry of Technology and Economics that was done in 2011 and it's entitled to be an international help for building energy efficiency policies and you'll see the web link here on the screen. Another new type of climate financing are the so-called NAMAs, the Nationally Appropriate Mitigation Actions, which as I said is a new tool emerging in the international climate negotiations and that can be used effectively to address greenhouse gas emission reducing projects including improving the energy efficiency of the built environment and there's been one example already of such work and that's in Mexico. Now, this is just one site that is provided where one can find interesting and up-to-date information, but there are others and you know, we'd be happy to provide you with additional links if so required. Then, finally, there is the initiative of the United Nations Secretary General with the so-called Sustainable Energy for All initiative, which was launched in 2011, which as one of its three objectives has energy efficiency—to achieve energy efficiency and to double the rate of energy efficiency by 2030. An important part of that solution is going to be energy efficiency in buildings as has been highlighted before. Then, next slide, please.

Okay. Then, this is really the final slide as far as I'm concerned. As stated by Didier at the beginning of the webinar, the energy consumption of the built environment is expected to increase in the coming years mainly in the non-IEA countries, the countries where we particularly work because they're—and it's very important to understand that that's where most—more than half of the building stock that will be needed if between now and 2050 has yet to be built. Therefore, if we are able to apply energy codes and energy efficiency measures right now, we can lock in very important savings in terms of energy use and greenhouse gas emissions. So, it's really our challenge to make sure that these new countries can benefit to the extent—of the latest available policy measures and technologies. Also, I would like to take this opportunity to thank the IEA. Partnering with the IEA on this policy pathway was for us a great opportunity to benefit for forty years of experience in the design and implementation of building energy codes in the IEA countries and I would like to thank the IEA as a set for this what we think was an excellent

collaboration and also, I would like to thank the donors, any donors that were involved in part of this work and all the experts and their contributions and last, but not the least, I would like to thank the Clean Energy Solutions Center for hosting this—today’s webinar and giving us the opportunity to share the main findings of this joint work of experts from the different parts of the world and I see there’s a healthy attendance today at this current webinar. Then, the policy pathway, the document at the presentation is now available. You can download from this web link that has been posted here. You can also find additional resources on the IEA’s website as well as UNDP’s website regarding either this current—recent publication on sustainable buildings or any other recent publications. That’s really all I have to say. I would like to thank everyone for their attendance and their interest and we can now open the floor for questions and I’m going to give it back to the moderator to introduce that part of the webinar. Thank you very much.

Sean Esterly

Alright. Thank you Marcel and I’d like to thank the rest of the panelists, Didier, Yamina, and Benoit for their outstanding presentations. We do have some great questions from the audience that we’ll use the remaining time to answer and discuss. Again, you can use the “question” pane on the right side of the webinar to send in any questions to us and first question is ‘The IEA recommends mandatory implementation of building energy codes worldwide, but is the implementation status in IE—what is the implementation status in IEA member countries?’

Didier Houssin

This is Didier here. Thank you for the question. Actually, it is a good question. We’ve tried in the IEA to track on a regular basis the implementation of our twenty-five energy efficiency policy recommendations and energy—and building energy codes. This is one of—then, the most important works probably for the building sector. So, what we’ve seen is that the implementation, of course, varies according the country—according to each country and also because—and also the way building codes are put together is different. In European countries, in general, building energy codes have adopted on a mandatory basis and whereby, in several countries, building energy codes are more previously voluntary than mandatory at federal level. It’s the case once in the US or in Canada and in this cases, it’s up to each state or to each province to decide whether the ones who made these provisions of the building codes mandatory at fair level, which means it’s too difficult to track, but the trend held over the last year has been to make—we’ve seen that more and more states and provinces make provisions as mandatory, but of course, even if you have the mandatory code, it doesn’t mean that it is implemented on the ground and that’s the key point. It’s how to check compliance and ensure that what is in the regulation or in the legislation is implemented in the grounds and of course, some progress has to be made everywhere. Compliance checking data do not exist and is quite difficult to check even if some methodology progress has been made in various countries. We do hope that the—we have the six sections on monitoring and evaluation within this policy pathway and we hope it’s going to be

useful for IEA countries whether they have mandatory or voluntary codes in improving in particular the monitoring and the compliance checking of their own building codes. Thank you.

Sean Esterly

Very good. Thank you, Didier. The next question I want to present to the panelists ‘How can codes be monitored for compliance by actual energy consumption when we know the variability from one occupant to another varies dramatically? If you can deal with the variability, how would corrective measures be incorporated after construction is complete?’

Dr. Yamina Saheb

Thank you for the question. This is Yamina. I will take this one. The first thing that we need to know is that when we predict energy consumption of buildings, we usually use engineering software. Unfortunately, it’s really rough that the engineering software includes inputs from social sciences. So, the only way to be able to model—the question is mainly about the behavioral aspects and the user’s pattern, the only way to be able to break their model and user’s pattern in the built environment is to conduct more research—social sciences research to inform the software. This is the first—this is the reality that we have now. With this then, what we could do I think now is when we predict energy performance of the buildings, we need to consider a factor—corrective factor for user’s pattern and this means that our building—we need confirm that it will be performing this a bit less than what it could perform from energy engineering’s perspective only within the calculation and then, this is the way to avoid these issues of the user’s pattern later on and then, the second part of the question is about how to implement collective measures after the construction is completed. If you remember the chart that Benoit shared on compliance checking, we don’t—it shows to think that we need to wait for compliance checking until the building is constructed. If you do that, it’s late. The game is over. You need to check compliance at each stage of the design and the implementation and the operation of the building. If you do that and if we do it correctly and if we do it on a regular basis, what we need to give to the market is the signal that the governments are checking compliance. We don’t need to check each building individually. We need to check sample of buildings on a regular basis at each stage and communicate compliance results. A very important point is to be very open about compliance results and to communicate them and to have well-defined and strong penalty. That’s the only way to make us moving forward and each time a penalty is implemented to communicate about the penalty and then, it will be clear that the government is taking seriously the implementation of building energy codes. Any other questions here?

Sean Esterly

Yes, thank you Yamina for that answer. The next question from the audience is ‘Where can we get technical financial support for developing or designing residential building codes and also pilot projects with implementation plan?’

- Dr. Yamina Saheb I think this is a question more for the UNDP. Either Marcel or Benoit can take this question. The IEA doesn't provide this kind of support. All that we provide is sharing best practices. Thank you.
- Benoit Lebot This is Benoit Lebot from UNDP. I must say that there is not a unique way for a given country to develop a strategy for implementing building codes. We believe that there's an excellent context today to engage such a program. On one hand, there is a UN initiative called Sustainable Energy for All and this UN Initiative calls for a doubling of energy efficiency by 2030 and to achieve these targets the building sector has to be engaged. So that is one important context under the UN Sustainable Energy for All Initiative. Another context is what Marcel introduced as a NAMAs, Nationally Appropriate Mitigation Actions, those are the measures that countries can implement to mitigate the ongoing gas emission and we believe that building codes are a great part of that type of policy, so this is the context. In terms of financing, there are so many available typically from the global environment facility if a link is made between the energy efficiency building code and greenhouse gas mitigation and if this link is made then money can be accessed through the global and human facility. This is almost our daily work at UNDP and most of the project we have been supporting over the past twenty years to promote energy efficiency in building has been financed by the GEF. We believe that more money is to come on this type of intervention through new carbon finance and climate finance, possibly the Green Climate Fund. So this is a—in short, there is not a unique place where money can come but there's a whole context that is extremely favorable and once there is willingness and interest...typically the UNDP is well blessed to have the country access the right funding for it.
- Sean Esterly Alright thank you. Next question for the panelist is which are the barriers most commonly found for the implementation of building energy codes?
- Yamina Saheb Thank you. I think this is going to be shared question between the IEA and UNDP. I will answer for IEA countries and I leave it to Marcel for the non-IEA countries. In the IEA countries where as we said building energy codes have been implemented in most of our countries on mandatory basis since the '70 so we already have baseline. They are not good in all countries. They are not accurate in all countries but we have something which is not the case in non-IEA country and then based on these baseline we already have technical capacity, we are civil engineers and economists and technicians trained on building energy code however there are not enough people trained even in IEA countries because building the kind of function in the built environment is quite complex and how to reduce it is also quite complex. So even in IEA countries we still need to build capacity. I think the main issue in IEA countries now there are at least two issues that I see for IEA countries. The first one is we have only three countries where building energy codes are overall performance code and based on the strategy of the three pillars that I've showed, energy sufficiency, energy deficiency, and renewable energy requirement and all

other IEA countries and we have twenty-eight, it means we have twenty-five countries where we still need to move from model code to overall performance code and some of our country's building codes are still not mandatory up to that level. This is the challenge that we have in our countries and then the common challenge in all IEA countries and they think everywhere to all countries over the world is compliance checking as highlighted by Didier. Compliance checking, we don't have—most of the IEA countries were not able to provide us with compliance data and if we don't measure what's going on so we don't know in fact what's going on. So to summarize, I think there is also need in IEA countries to build capacity to work the model approach and to put more emphasis on compliance checking to basically inform the update of building energy code in the future. I leave to Marcel for the specific challenges that UNDP and non-IEA countries need in the design and the implementation of the building energy code. Marcel please.

Marcel Alers

Yes, thanks, Yamina. Okay for developing countries—I mean first of all energy efficiency in general and building energy codes in particular, are really a process which is very complex. It's very challenging even in the most developed countries to properly design and after that to actually implement and enforce compliance. It's not easy. Typically, this becomes even more challenging in a developing country context. I want to say that our very first so-called barrier through the adoption of energy codes is simply a lack of awareness if not outright ignorance. People just have not heard about it or only a very small number of people but in general it's not something that people are commonly aware of, that is an issue first of all and that you can actually do something about it.

Second, there's a serious lack of technical capacity at all levels just to design these things but then also that you get it through the legislative process, to get it properly implemented and all that, big problem. Benoit mentioned already another barrier which is just a lack of information. We have no data in those contexts. There is no reliable statistics any of this, very challenging. You often have to start from scratch building your database to show that, 'Okay, this is what we...' just to know what we are consuming now, right now and to get the details of that and so then see where are the main losses, how can you address, etc. Not available.

Compliance has been mentioned, the ability to actually enforce these codes, very big problem. Most countries are not properly tooled to stand up even if you have say, at the central level, at the national level, some entity, an outfit that designs these codes which can be state of the art and all that but you know often compliance that has to be done at the municipal level—well a lot of the building, the permits are being handed out like the inspection state base, etc., often does not exist, so you really have to start building this. Another issue can be but often is finance. Even though it's well known that building codes do lead to lifetime savings, still often some of these mergers will incur enough from cost which is higher than going into lowest cost option. So finance can be a problem, either the

availability or the access to it. Technology is often not available or is expensive, or is unknown. Worldwide, yes, a lot of the technology exist and is readily available but not necessarily in all countries and often it comes from real work. It's not available, so you have to work on that or even if it's available we have no technicians that know how to install it or have not been trained.

Low-energy prices is very often a huge disincentive to energy efficiency in general including the buildings. Energy can be heavily subsidized and it is in many countries. So the lower the prices, the lower the attempts to try to save energy or it lengthens your payback time, so again it's a thing but these are very hard issues to deal with at a political level, often very political in nature. Then there are issues like what we call the split incentive whereby the building owner hazard or the construction or the company who constructs the building is not the same that subsequently occupies it so whoever pays the energy bills not the same who has to incur the cost of making the extra investments for energy efficiency measures. So here again this is a classic example which is common, it's not specific to developing countries but it's also a big issue in developed countries. I think this list is long enough so I will have it back to the moderator for another question.

Sean Esterly

Yeah, thank you. So the presentation shared the shift from component efficiency through building system efficiency. Which government has found the most success in moving the building systems performance, whole building approaches? Then the second part of that question is what has been the biggest barriers besides compliance concerns but you already addressed that a little bit?

Yamina Saheb

Thank you for the question. I will take this because I'm also involved in my country and directly in shifting from model code to overall systems code. I will include, I will come back to the barrier issue, I think the main barrier that we have been facing and that all countries face is the shift that is needed in the mindset. I remember six years ago, it was almost impossible in front to discuss with market officers involving the building sector and with those involved in the design of the building energy code about overall performance code and from that minimum energy performance for each building site and each climate zone that goes before 2007. I will give you the first experience because it's the one that I well, what happened is that in 2007 we had an important environmental concern in Paris and all market officers were involved in the discussion about energy consumption impact of the building environment. As a result of this discussion of having all the stakeholders together learning to talk to each other, this is what was surprising is that construction industry is not used to public service, but is used to talk to policy makers or for NGU, etc. As a result of that the French institute in charge of the design of building energy codes and they worked on their update for 2012, they designed overall performance building energy codes from that performance for each building site and each climate zone and it is implemented. What I may

have to tell you that in the meantime during this same period in Europe we have an update of the European directive for buildings and the European directive for building stated that we have to move to performance building code to overall performance code, so it was already in our regulation, in the European regulation and we had to implement it and in the case of France when they updated their code they made it—they adjusted it to the requirement of the directive and at the same time during this period between 2006 to 2012 when the code was published we had the new label for building that we call low-energy building label and this label was based on overall performance code and the requirement that we have now in the building energy code is the one that was in this label so at that time we had only few buildings, so we had five years, let's say five years of learning code. All market officers learning on how to move from model code to overall performance code and when the code was released we had no big issues for its implementation. Of course you always have some complaining but it hasn't been a big deal from what I know. I think from my perspective it will be easier in non-IEA countries where we have to start from scratch because—especially countries where we have to start completely from scratch where nothing has been done yet—to start now working directly on overall performance code because we know that this is the way forward and to avoid mistakes that we have been making in our countries and looking at the same potential in these countries which will play a major role in the overall energy security. Thank you, can we go to the next question please.

Sean Esterly

Yes, thank you Yamina, the next question was regarding something that Benoit stated that building energy use has gone down in IEA countries from 1990 to 2009 due to a key point which was noted that was compliant and ultimately effectiveness of the building energy code. Does UNDP or the IEA have any data on compliance rate with building codes in either developed or developing countries?

Benoit Lebot

This is Benoit Lebot from the UNDP. I am afraid that from our side we don't have—we are not yet in which level where we can have this data. We are still in the process of implementing building codes supporting the country to move from first block of the building code and I leave to maybe Yamina to compliment on the level of compliance in the IEA world about building codes. Over to you Yamina.

Yamina Saheb

Okay, thank you Benoit. So the slide that have been showed by Benoit shows that progress has been made in reducing the primary energy consumption in the residential sector in IEA countries. This progress is due to two reasons. In most of these countries be implemented energy efficiency policy for buildings and for appliances and equipment at the same time and at the same time of course we may have thought that we have so many technology progress made between 1990 and 2009. When they said that we see that from energy consumption perspective, we see reduction in the energy consumption but at the same time we cannot allocate at this stage at least we cannot allocate these saving to the

effective implementation of building energy codes only because compliance data are not—well they said they don't exist, they are not aggregated at national level and there are some data at regional level in new countries in some regions or some cities, they are not unfortunately aggregated at national level. The only country where data so far are aggregated at national level is China and in China the government decided a few years ago, five years ago I think, to have the government officials rechecking the compliance that has been done by local authority and then the aggregating data and they analyze that but we have to be a little bit careful with the Chinese data. It's not only about having the data. It's about having the right data. It doesn't mean because the paperwork—if you say in paper that you are going to comply with the building code but in practice you really comply. We really need to go through another slide that Benoit showed and the different sets in the compliance checking. I do believe that in the future, progress will be made in IEA countries and some of the BRICS countries in collecting compliance data. Thank you, can we go to the next question please.

Sean Esterly

Yeah, the next question is, what role city can play in achieving successful building codes.

Yamina Saheb

Thank you. I will take this question. City play a major role in achieving low-energy building stock, low-energy and low-carbon building stock. This is doable I think only in very ambitious cities where we already have energy and carbon reduction target. Why? Because if you have these targets at the city level this means that the land use policies will include energy and carbon reduction target. This means that land use policies will be adjusted to better consider bioclimatic design principle, if you remember in my slide where it showed the three-pillar energy sufficiency and energy efficiency, renewable, you will see that two times implementation of energy sufficiency measures and the slide for renewable we need—they are included in land use policies. So really the most ambitious cities in the world in terms of energy and carbon reduction will be leading the world in terms of low-energy and low-carbon buildings in the future. Thank you next question please.

Marcel Alers

Sorry, can I jump in here just to add a few words to what Yamina just said. This is Marcel speaking from UNDP. Just to emphasize this issue of the importance of cities, we feel that it's actually absolutely critical—the of role cities to ensure that these policies are being implemented. You can set standards at the central level as I said earlier on but most of the implementation and compliance will occur at the city local level and actually we see that often, the municipality especially the larger ones, the largest cities can be critical. It's pulling forward whereas at the central level where there can be political barriers impeding progress, we can see some of the more progressive moves happening at a more local level. For example we see this at the United States where sometimes or very often actually at the regional or local level we see more progressive work

happening than what is being set at the central level. So I think cities are key at achieving this.

Sean Esterly Thank you. The next question from the audience was, it looks like market stimuli are extremely important for the code that actually have any significant impact on energy consumption of buildings. Do you have any best examples of this?

Yamina Saheb No, if we start with taxation, we will not go anywhere I think. The first thing to do is to make building energy codes mandatory. We could use in countries implementing building energy codes for the first time or when we are switching from model codes to overall performance code when it's really needed, we could use incentive for a few years but really the policy that would use the consumption is building energy codes and not the taxation, so we don't know about any good practices and I don't think they exist actually. Thank you, next question.

Sean Esterly Yes. Are there any explanations for the energy consumption growing in Spain and Australia?

Didier Houssin Okay this is Didier speaking. I'm going to take this one. I think this is referring to the energy consumption at the building sector and housing and for these two countries we saw an increase in cooling request and it's interesting to see also that when we see heat waves happening it has an impact of course on energy demands so it might be over the long term of an important impact of climate change increasing demands for cooling in summer period of time. This link first maybe partly to global warming and secondly because we see that sometimes the quality of appliances in terms of energy efficiency is not really good so one that needs to be addressed also is the quality of appliance that I use in heating as well as in cooling and in this policy pathway we show that there are different levels, of course the global level and also the question of quality of equipment needs to be taken into account. I like also to take the opportunity to stress one point, we mentioned several time but it was difficult to track implementation of building code but we shouldn't be misleading. It doesn't mean that even if it's difficult to attribute specifically to building code some of the progresses that have been made, we've seen and we have a chart from this day, improvement of global level in terms of energy efficiency of buildings in IEA countries and it's certainly to a large extent link to building codes even if it's difficult to attribute in a very specific manner some of the progress of the building code the lack of data doesn't mean that there is not a very positive impact of these building codes. Thank you.

Sean Esterly Thank you. The next question has to do with bioclimatic and passive building techniques and sustainable technologies, they point out that the emphasis is typically on efficiency of cooling, heating, and mechanical systems but in countries with suitable climate, there's a perceivable lack of

reliable technical data for such measures, the bioclimatic and passive building techniques in building codes, how can this be addressed?

Yamina Saheb

Thank you this is really good question and we see that in the last thirty years the main focus has been true on improving the efficiency and mainly the technological improvement of efficiency of heating and cooling system which is basically the second step if you remember my three pillars. Basically most countries were two things, on the energy efficiency part and they forgot about the first step which is the energy sufficiency measures by using energy needs through bioclimatic design principle. What we need to have is what I described is most advanced that exists already in the most advanced scope is to have requirement on energy sufficiency method on bioclimatic design principle, there are now indicators that allows to access how your building comply or doesn't comply with bioclimatic design principle. I think this is the way forward and this is something that we have to build for the future and it's not about data, it says about changing again the mindset and starting where we should be starting reducing the energy need and working more at the master plan level of the land use. We have land use policies to maximize the saving potential through the orientation of the buildings and the natural or, what is free. Maybe Benoit would like to add something about how to address this question in non-IEA countries. Thank you.

Male Speaker

Yes indeed, what is interesting in our work to promote low carbon buildings in the developing countries. In fact technologies are known in the building sector to build building that are healthy and compatible with the climate. What has come a difficulty is the modernity of the construction sector and now many countries have forgotten the past habit of the ancestors to be with the climate and take the case of building housing with clay or earth brick, this is a very interesting solution to not only be comfortable in the new building but also to lower the energy demand and this type of old technologies have been forgotten and sometimes in our work we need to just force the stakeholders to just look at the past and at the old construction and by the way there is some interesting lessons to be learned from the bioclimatic solution that our ancestors knew because as the climate is evolving and we've heard about heat wave or there are floods, we also have to adjust building sector through the evolution of climate and we believe that building codes not only should address climate change mitigation but also our part of adapting the whole society and this is where we can also rely on bioclimatic and yes we can use a modern instrument, modern tool but just looking back to the history and the way of building and cities were build we can draw some very interesting lessons for the future. Thank you.

Sean Esterly

Thank you. Next question is what are the measures that the IEA and the UN take in order that the principles of sustainability in a built environment are implemented in developing countries in order to avoid a huge future load of CO2 emissions coming from the emerging metropolis both in

order to create market tendency towards more sustainable material selection avoiding the depletion of the non-renewable raw materials?

Yamina Saheb I think we leave this question for our UNDP colleagues as it's more about non-IEA countries.

Marcel Alers Yes, thank you. I am here. Sorry I have to unmute myself. Yeah, this is Marcel speaking. What are we doing, well what we have been saying here since the beginning of this Webinar is a good example of the kind of stuff that we do to provide assistance to countries and help them access available financial resources and in doing so are provide them with technical assistance to be able to use this more advanced thinking and help transfer that knowledge and those technologies to the developing countries. Now there are certain international treaties, climate, negotiations framework where countries—and most countries are a member of that of ratifying those conventions. In doing so, they have taken obligations, obligations to undertake some of these things. So typically then we place a heavy emphasis on helping build the capacity at all the levels required to undertake, to design and implement building codes. We also help to mainstream these considerations of climate change both at the mitigation and the adaptation level into the economic development policies of countries. So really to merge it with everything else that is happening in countries and make it an integral part in the decision-making process to ensure that these questions are being asked at the right time. I don't know Benoit if you would want to compliment some of it.

Benoit Lebot No need to compliment.

Sean Esterly Thank you. We'll go on to the next question which is compliance with building code seems to be a large problem and energy performance of new building is often unknown or little investigated, what can or will IEA and UNDP do to increase the focus on compliance of building codes both in IEA and non-IEA countries?

Didier Houssin Okay this Didier speaking, I'm going—so to reply to this good question and we've already discussed it partly. First one of the problem is that for many countries the building codes are decided at the federal or state level whereby the implementation is very important at local level and all the city is important at the role of local stakeholders, local authorities is also quite important in making sure that the regulation is actually implemented on the ground. Again, I like to stress that the fact that the compliance data is not already available doesn't mean that the codes are not implemented and of course IEA countries have their legal system that ensure that such codes when they are mandated they had to be implemented even if they don't collect just a big data for that. It's one of the points that we have addressed in the policy pathway the question of monitoring and the question of improving data collection and making sure that compliance is a part of the reflection how to put together a building code from scratch.

I'd like also to stress the importance that each one of points that we make in the policy pathway to have a global approach rather than a too detailed and prescriptive approach as it used to be the case and to ensure compliance which you have a global approach, very important to involve all stakeholders and to make sure that awareness going among local authorities and among policy makers but also among the industry and the building sector at large about the importance of the building code and about compliance issue. Again if you have involved stakeholders from scratch then the compliance will be much easier to achieve on the ground. Thank you.

Benoit Lebot

This is Benoit Lebot from the UNDP. I can also provide some complimentary answer here. First of all this issue of compliance for us is also very much linked to the current context. We believe that the context is really good now to engage the successful policy in the building sector. There is the UN Sustainable Energy for All Initiative focusing the global target of doubling energy efficiency by 2030 based on NAMAs, the National Appropriate Mitigation Actions but countries are anchorage to develop and hooking energy efficiency policy to this type of initiative can help. Especially on NAMAs we believe that CDM, Clean Development Mechanism, and carbon finance has failed so far to deliver financial support to energy deficiency in the building sector but we don't want to give up on this possibility and we believe that the more a country will elaborate a strategy the more likely this country can maybe obtain some financial support based on global energy facility money. There is also money to come from the Green Climate Fund but possibly there will be some money to be coming from some market-based mechanism, the future of CDM, and this is where linking the compliance and the tool for compliance to this type of tool and new context will be pushed. One element to make this happen is to include in the development of energy sufficiency building codes a rating that can be then used not only for the compliance but to support the whole policy. We quickly want to avert the example of [Indiscernible][1:24:57] where there is a rating scheme for building that is very useful to introduce a minimum energy requirement but also to encourage further steps. We follow carefully the development of mandatory levying of energy performance of buildings in some IEA member countries. If you go online, if you purchase an apartment or building in some IEA member countries you have to have an energy rating and this type of tool helps the decision process and will help also the compliance and final point, once you have rating scheme for example and some implementation from some labeling, you can see, you can easily invent or put in place some specific financial mechanism such as tax, physical incentive to maybe reward the transformation to more energy buildings and this is where this whole sweep of decision that has to be taken to make sure that compliance at the end of the day will be fully addressed. Over to you moderator.

Sean Esterly

Thank you. We have time for two more questions. Any questions that we don't address during the Webinar we will be emailing to the panelist and

they'll get back to you as soon as possible to address those. So the last one of the two questions is which countries are already running some energy efficiency program for improving existing buildings at a national level?

Yamina Saheb

I will take this question because the issue of existing building is mainly a challenge for IEA countries and some of the BRICS countries. In IEA countries we have Germany running a national program to improve the energy efficiency of its existing stock. The program is managed by ISW and it's one of the best practices that we have so far in terms of energy requirement—stringency in terms of how to make a stringent energy requirement implemented each time a building is renovated. However, with the German program less than 1% of the building stock is patterned. So, the challenge is still huge. Far away from Germany we have the UK that just implemented a new policy for the Green Deal. The Green Deal is not as stringent as the German program intend of energy efficiency requirement but the Green Deal from finance design is quite interesting and fortunately a good renovation strategy has to be designed and this is what most of the IEA countries are working on now because the Europeans adapted last year the energy deficiency directive that made mandatory for European countries to renovate 3% every year of their public building owned and occupied by example government. So I think we are in the learning stage but we have to speed up because of the challenge of the existing building stock. Thank you. Next question please.

Sean Esterly

Yes and the last question is during the implementation each of these modern building energy codes require—do each environmental building codes require an environmental impact assessment?

Yamina Saheb

No, not really, I think that the environmental impact assessment is the next step that will probably be there in countries where this is already a clear target, the deadline for implementation of zero energy buildings is already set. Why I think that it will happen in this countries because in nearly zero energy consumption building, the share of the consumption of the inverted energy is much higher than in non-efficient building, so I think in the future this will come up but this is again something for the future. I think what we have to do now is to design the energy building code to be overall performance and following based on three pillars described. Thank you.

Sean Esterly

Alright thank you again to all the panelists. Again if your question wasn't addressed during that question and answer session we are out of time for that but the questions will be emailed to the panelist and they'll get back to you as soon as possible. Now before we end I just like to ask everyone to take a quick survey but before we do that I'd like to provide the panelist with an opportunity for any closing remarks.

Didier Houssin

Thank you Sean. Just a few words from Didier to thank UNDP colleagues for their participation to this panel and more generally for a very fruitful cooperation with UNDP on this project and specific thanks for Clean Energy Solution Center for hosting this Webinar, I know it's very early

now in the state and we do appreciate your efforts in putting together this Webinar, thank you.

Yamina Saheb This is Yamina. I would like also to thank our colleagues from the Clean Energy Center Solution. It's quite early for them. Thank you so much for this collaboration on the last step of this project and I would like to thank our UNDP colleague and all the experts from all over the world who contributed to this project and my last few words from the IEA is to wish you successful and effective building energy code.

Sean Esterly Alright thank you again. Now for the survey, please take a minute just to answer a quick survey on the Webinar you viewed today with three short questions for you to answer and your feedback is very important to helps us know where we can improve. Heather, can you please display the first question, thank you. The first question is the Webinar content provided me with mutual information and insight.

Sean Esterly The next question. The Webinar's presenters were effective.

Sean Esterly The final third question is, overall the Webinar met my expectations.

Sean Esterly Alright, thank you everyone for answering this survey and on behalf of the Clean Energy Solutions Center, I'd like to extend a hearty thank you to all of our expert panelist for their great presentations and on our attendees for participating today's Webinar, had a great audience and we very much appreciate your time and that I invite our attendee to check the Clean Energy Solutions Center website over the next week or two if you like to view the slide and listen to our recording of today's presentations as well as any previously held Webinar. We have a nice archive of those up there. Additionally, you will find information on upcoming Webinars and other training events and we also invite you to inform your colleagues and those in your network and solution center resources and services including No Cost Policy Support. Please have a great rest of your day and we hope to see you again at future Clean Energy Solutions Center events. This concludes our Webinar.