



2019 Report on the UNECE High-Performance Buildings Initiative

Background

Buildings are central to meeting the sustainability challenge. In the developed world, buildings consume over 70% of the electric power generated and 40% of primary energy and are responsible for 40% of CO₂ emissions from the energy services they require. In Europe, 75-90% of today's buildings will be in use in 2050. Developing countries will need to accommodate 2.4 billion new urban residents by 2050. Renewable energy technology alone cannot meet these requirements, despite recent improvements. The energy performance of buildings must be managed. The capability to meet the challenge exists today.

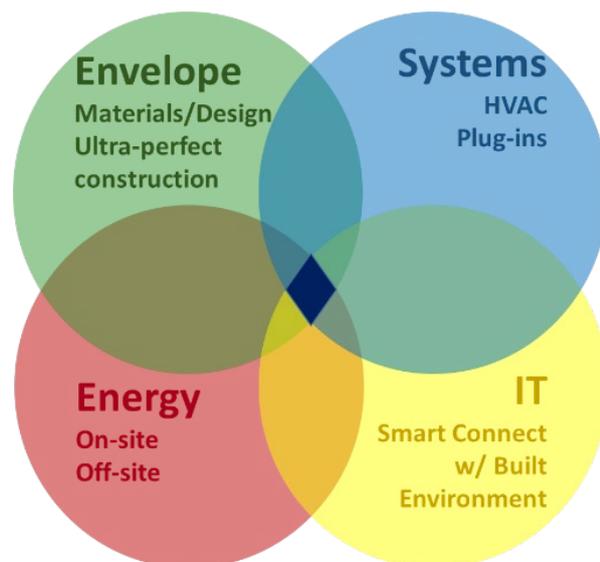
High performance buildings are key to achieving the 2030 Agenda. They help deliver on many of the Sustainable Development Goals in areas including:

- promoting sustainable urban development by recognizing buildings as complex systems embedded in community, city, and country-level energy networks
- tackling poverty by reducing energy bills
- accelerating the sustainable energy transition by improving the efficiency with which buildings' energy services are provided, and
- supporting climate action by reducing the energy requirements of buildings to a point at which residual needs can be met by no or low-carbon energy sources.

UNECE launched the high performance buildings initiative to deploy its Framework Guidelines for Energy Efficiency Standards in Buildings¹ and its Geneva UN Charter on Sustainable Housing with the aim of accelerating the transformation of the world's building stock. The initiative focuses on capacity development and impact in the field, developing:

- the intellectual, material and financial resources to educate, advocate and advise for transformation to high performance buildings;
- the outreach required to create a worldwide urban shift to truly sustainable buildings.

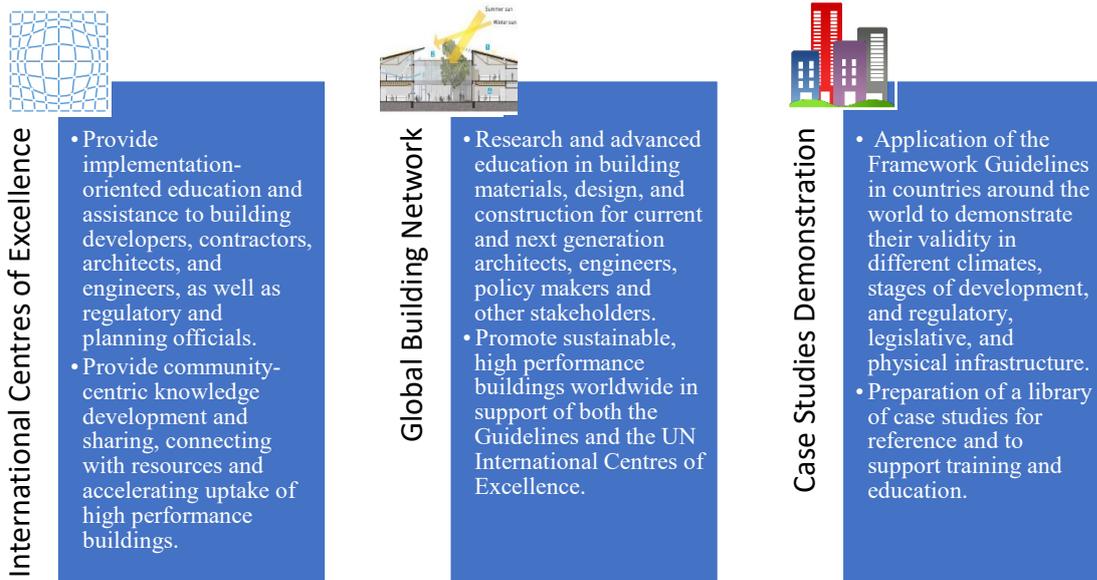
The ultimate objective is to improve health and quality of life within the built environment while simultaneously decarbonizing building-related energy requirements. Architects, building contractors, and engineers are those who are perfecting building envelopes – getting the materials and design right and then ensuring perfect construction techniques. Systems professionals deliver heating, ventilation, and air conditioning as well as plug-in loads. Energy suppliers are essential if we are to ensure no- or low-carbon solutions meet the systems' needs. Energy can be provided on-site through a distributed energy services model – imagine roof-top solar or on-site storage – or through some sort of network connection. A fourth community delivers on ICT – the information and communications technology that connects a building to its built environment.



¹http://www.unece.org/fileadmin/DAM/energy/se/pdfs/geee/geee4_Oct2017/ECE_ENERGY_GE.6_2017_4_EEBuildingGuidelines_final.pdf

Rather than address efficiency or quality on a component-by-component basis, the Framework Guidelines deal with a building as a complex system in its own right, one that is embedded into a community then into a city then into a regional or national network. ICT connects all the parts and allows for system-wide optimization that enables full participation by both consumers and intermittent energy resources. Until now, each of the four communities have been operating as stand-alone contributors. Getting them to act together enables an integrated approach, unlocking the potential of buildings to make the ambitious vision of the 2030 Agenda a reality.

HPBI comprises three pillars aimed at radical reduction of the global carbon footprint of buildings and dramatic improvement in the health and quality of life provided by buildings.



Objectives and Targets

The High-Performance Buildings Initiative aims to achieve the following objectives:

- ***Moving the dial on building energy performance:*** grow the number of localities with building codes aligned with UNECE Framework Guidelines; ensure most new buildings are certified compliant; reduce by 60% the average energy requirement per square meter in the new building “fleet” and by 10% for existing buildings.
- ***Moving the dial on GHG emissions and indoor air quality:*** reduce by 40% CO2 emissions associated with meeting buildings’ energy service needs; increase by 10% the amount of carbon “stored” in buildings; improve indoor air quality and reduce pollution-linked health issues.
- ***Improving the global supply chain for the construction business:*** enhance “carbon storage” by increasing embedded carbon in buildings and building products and by reducing waste.
- ***Extending the network:*** recruit new centres of excellence and academic institutions to accelerate uptake of high-performance best practices.



Criteria for International Centres of Excellence on High Performance Buildings

The International Centres of Excellence on High Performance Buildings (ICE-HPB) are a collaborative network of organisations focused on supporting their local industry in the rapid development of next generation buildings consistent with United Nations Framework guidelines for energy efficiency standards in buildings. The centres provide education, training, and other critical resources to regional building industry practitioners, while sharing these resources globally through collaboration with other network participants.

Mission

Advance the rapid transition to high performance buildings, locally and around the world, in support of the United Nations Sustainable Development Goals and Paris Climate Accord, while fostering a thriving building industry that creates healthy, comfortable, and sustainable buildings everywhere for everyone.

Criteria for ICE-HPB Designation

1. *Committed to the objectives of the UNECE Framework Guidelines, including dissemination, training, and education*
2. *Committed to the objectives of and active engagement across the network of International Centres of Excellence and the Global Building Network*
3. *Established as a going concern/legal entity with strong relationships in the local buildings communities*
4. *Must have (local) political support and visibility*
5. *In compliance with norms and requirements regarding potential conflicts of interest*
6. *Demonstrated competency and capacity in the areas of high-performance buildings and training*
7. *Self-funded (responsible for raising the financial resources needed for their operations)*
8. *Must have physical infrastructure (or access to it), including organizational infrastructure and a regional ecosystem that primes the centre for success, and demonstrated delivery mechanism*
9. *Committed to an agenda relevant to the local region based on an agreed menu of activities and projects*

Terms of Reference for International Centres of Excellence on High Performance Buildings

Activities and Projects

The mission of an ICE-HPB designated by the UNECE is to connect real estate and design professionals to energy efficiency solutions through education, exhibitions, demonstrations, resources, and research. The ICE-HPB identifies opportunities, navigates barriers to adoption, brokers relationships, and showcases best practices and shares resources globally through the ICE-HPB network.

The ICE-HPBs help building developers, owners, operators, and designers save energy and reduce building-based carbon emissions through implementation and adoption of energy efficiency measures and best practices. Their activities directly support players in achieving their climate action agendas and deploy and disseminate the UNECE Framework Guidelines for Energy Efficiency Standards in Buildings.

The activities and projects of an ICE-HPB will include:

1. Convening dialogue amongst local and international industry leaders to identify challenges, share best practices and build a growing and diverse community of practice;
2. Gather and disseminate knowledge directly, and through partner organizations, including education and training, exhibits, case studies, research, demonstrations, and the production of industry focused print and on-line resources;
3. Catalyze design and construction industry tools and training development, and identify potential barriers to adoption and implementation; and
4. Foster public demand and support for best practices through recognition and awards, open houses and tours, public events, and demonstrations.



Activities of the International Centres of Excellence on High Performance Buildings

In 2017 UNECE adopted the Framework Guidelines for Energy Efficiency Standards in Buildings. On 10 July 2018, the Building Energy Exchange (BE-Ex) of New York City signed a Memorandum of Understanding with UNECE to become an International Centre of Excellence on High Performance Buildings, and on 13 September 2019 UNECE and Pittsburgh's Green Building Alliance (GBA) signed a Memorandum of Understanding launching Pittsburgh's International Centre of Excellence on High Performance Buildings. Additional centers are underway in Vancouver, British Columbia; Wexford, Ireland; Sophia, Bulgaria, and Brussels, Belgium. The network will expand as other communities join.

Results obtained

Building Energy Exchange

The Building Energy Exchange (BE-Ex) is a centre of excellence dedicated to reducing the effects of climate change by improving the built environment. BE-Ex accelerates the transition to healthy, comfortable, and energy efficient buildings by serving as a resource and trusted expert to the building industry.

In just the last year (October 2018-October 2019), BE-Ex has developed over 60 programs, events, and trainings, reaching over 3,000 people.

BE-Ex has enjoyed more than 20,000 visitors since our opening in 2015.

This year's programs included over 20 deliveries of BE-Ex's Passive House Primer - an engaging, one-hour seminar on Passive House fundamentals and their application in the NYC market. This training is offered free of charge both here at BE-Ex and at offices across New York City and the surrounding region.

Additionally, in the last 12 months, BE-Ex has produced over 20 educational resources (case studies, reports, and tech primers), including numerous programs and tools focused on NYC's Climate Mobilization Act.

In 2020 BE-Ex will be launching a new exhibit, Anatomy of an Energy Efficient Building, which aims to demystify energy efficiency by making building energy systems and key efficiency solutions digestible and interesting.

Green Building Alliance

Green Building Alliance (GBA) hosts Greater Pittsburgh's International Center of Excellence on High Performance Buildings in an effort to advance rapid transition to high performance buildings locally and internationally, while fostering a thriving building industry that creates healthy, comfortable, and sustainable buildings for all.

GBA works with stakeholders including building owners and operators, K-12 educators and facility managers, academics and researchers, architects, engineers, contractors, community members, and government officials to create health and vibrant places. GBA fosters networks of professionals to advance sustainability in our region, including the International Living Future Collaborative, the Emerging Professionals, and the Women+ in Green network. GBA convenes the Pittsburgh 2030 District - the largest in the world with over 700 buildings committed to reducing their energy use, water use, and transportation emissions by 50% by the year 2030, while improving indoor air quality.



The International Center of Excellence is an extension of GBA's existing programming, technical assistance, trainings, and outreach activities with an opportunity to scale these efforts to realize greater impact. Over the next few months, GBA will establish a Center of Excellence advisory board and convene a series of workshops with local partners and stakeholders to better align regional activities and initiatives.

1. *Education and Networking Event Highlights from June 2018 to June 2019:*
 - *99 educational and networking events for 3,400 professionals from a variety of backgrounds*
 - *Offer trainings in LEED, GPRO Operations and Maintenance,*
2. *Certified Passive House Designer and Certified Passive House Tradesperson*
 - *Provide Passive House Lunch and Learns for businesses and government agencies to increase the knowledge and demand for these trainings and practices*
3. *Technical Assistance Highlights from June 2018 to June 2019:*
 - *1000+ hours of technical consultations on 165 regional projects, buildings, and future developments*
 - *550 buildings benchmarked for 2030 District energy, water, and transportation goals*
 - *40 K-12 Schools benchmarked to 2030 energy and water goals*
4. *Green and Healthy Schools Academy Highlights from June 2018 to June 2019:*
 - *31 schools/districts actively participated in Green & Healthy School Academy activities*
 - *10 mini-grant projects funded and implemented to advance sustainability in schools*
 - *8 school projects linked to funding and financing*
 - *5 school projects provided technical assistance*
 - *78 Participants in School Sustainability Culture Program workshops*
 - *108 educators participated in professional development*
 - *225 youth engaged in learning and civic engagement opportunities*
 - *4 educators participated in Drawdown Teacher Cohort, and 18 lessons and curriculum on Drawdown created*
5. *Sustainable Communities Highlights from June 2018 to June 2019:*
 - *16 neighborhoods, communities, and municipalities engaged in discussions on sustainable communities*
 - *12 developments, buildings, and places provided technical support through the Uptown EcoInnovation District*
 - *9 communities empowered as eco-districts or other community framework*
 - *2 comprehensive neighborhood plans underway that incorporate the UN Sustainable Development Goals in the process*
6. *2030 District Highlights from 2018:*
 - *542 buildings with committed 85.1m sq ft for reporting*
 - *23.5% energy reduction from the 2003 baseline*
 - *18.6% water reduction from the 2013 baseline*
 - *26% reduction in transportation emissions from the 2013 baseline*
 - *\$38.5 million in dollars saved; over \$115M saved since 2012*
 - *225 District Affiliate buildings with 7.1m square footage reporting*
 - *20,310 Make My Trip Count survey participants*
 - *300+ properties tracking Indoor Air Quality metrics through performance and best practices*
 - *969 event attendees at 2030 Partner Meetings, Bridge to 2030, and Progress Report Reception*



Zero Emissions Building Exchange (Vancouver, Canada)

[N.B., UNECE has not yet signed an MOU with the Zero Emissions Building Exchange (ZEBx) to establish it formally as an ICE-HPB, but that is a formality as ZEBx was one of the founding organisations of the initiative.]

ZEBx is a collaborative platform that strengthens the public, private and civic capacities for zero emission buildings in Vancouver and British Columbia. We are an industry hub that facilitates knowledge exchange and catalyzes action to accelerate market transformation.

Vancouver has one of the most progressive set of policies around zero emission buildings and industry is being challenged to respond quickly and innovatively. By 2025, the City of Vancouver will require most new buildings to be near zero emissions and all new buildings to be zero emissions by 2030. Under the BC Energy Step Code, all new buildings in BC will be built to net zero energy ready standards by 2032 or sooner. ZEBx is dedicated to supporting the industry through this transition, acting as a catalyst that builds capacity by convening and advancing solutions from leaders and early adopters that are building tomorrow's buildings, today.

A total of 35 events were delivered in 2018-2019, reaching over 2,830 participants.

Demonstrations

- *BC Housing: Build Smart - Key Considerations for High-Performance Walls Webinar*
- *CORE Energy Recovery Facility*
- *International Brussels Tour*
- *James Dean's Open House (PHC partnership)*

Workshops

- *Heat Pumps for Domestic Hot Water*
- *High-Performance Curtain Wall*

Dialogues

- *BE-Ex livestream: Carbon Neutral by 2020*
- *BE-Ex livestream: Passive House Towering in NYC*
- *High Density Passive House*
- *PHPP User's Group/Passive House Technical Group x4 (PHC partnership)*

Community

- *Communities of Practice*
- *Community Lunch 'n' Learn*
- *High-Performance Developers Dinner*
- *Inclusion in Passive House x2 (PHC partnership)*
- *Industry Christmas Party*
- *Industry Cluster Pecha Kucha*
- *LFV Earth Day Celebration*
- *Passive House Intro for Kids*
- *Passive House Socials x10 (PHC partnership)*
- *ZEBx Launch*

Conferences

- *BuildEx*
- *Passive House Conference*

EDUCATION DELIVERED

Through our ZEBx led and partnered education, we delivered over 16,930 participant training hours, totalling over 620 education participants.

Passive House Canada Partnered:

- *Exam Prep - Passive House Designer/Consultant Exam x3*
- *Intro to Passive House High Performance Buildings x4*
- *Passive House Design and Construction x10*
- *Understanding and Working with PHPP x7*

Industry Partnered

- *HVAC in Large Passive House Buildings*
- *Passive House Building Certification*

PROGRAMS DELIVERED

- *C40'S Women4Climate Mentorship Program - <https://www.c40.org>*
- *NearZero - <http://nearzero.ca>*
- *ZEBx Case Studies - <https://zebx.org/resources/#case-studies>*



Wexford and Ireland

[N.B., UNECE has not yet signed an MOU with Ireland to establish its ICE-HPB, but that is a formality as Wexford has been one of the founders of the initiative.]

1. Education and Training by WWETB

The following activities were undertaken by the Waterford and Wexford Education and Training Board (WWETB) pertaining to education and training:

- *Development of National Skills Specification on Nearly Zero Energy Building (NZEB) Training for Contractors*
- *Development of Dedicated NZEB Contractor Training Centres*
- *Roll-Out of Training*

1.1. Development of National Skills Specification on Nearly Zero Energy Building (NZEB) Training for Contractors

Waterford and Wexford Education and Training Board (WWETB), with assistance from MosArt, drafted the first-in-the-world trade-specific contractor skills specifications for delivering NZEB, both new-build and retrofit. The Skills Specifications were developed in close consultation with a National Advisory Panel, members of which are pictured and listed below.

NAME	Organisation
Sean Armstrong	Department of Housing, Planning & Local Government
Emmanuel Bourdin	Department of Housing, Planning & Local Government
Albert Jordan	Department of Communications, Climate Action & Environment
Pat Lehane	Irish Ventilation Industry Association (IVIA)
Paul Martin	Sustainable Energy Authority of Ireland (SEAI)
Orla Coyle	Sustainable Energy Authority of Ireland (SEAI)
Gary O'Sullivan	National Standards Authority of Ireland
Padraig O'Gorman	Wexford County Council
Simon Jones	Construction Industry Federation (CIF)
Tony Lynch	Gas Networks Ireland
Lorcan Cooke	Gas Networks Ireland
Liam Doyle	Gas Standards Technical Committee
Elisabeth O'Brien	Limerick Institute of Technology
Seamus Hoyne	Limerick Institute of Technology
Pascal Harte	Institute of Technology, Carlow
Paul Quirke	Waterford Institute of Technology
Brian Nolan	Irish Congress of Trade Unions (ICTU)
Tomás O'Leary	MosArt
Denis Rowan	Denis Rowan & Associates
Michael O'Brien	Innovation and Development Manager, WWETB
John Cassidy	Training Services Manager, WWETB
Shay Cummins	Unit Manager, WWETB

Skills Specifications

The Skills Specifications were developed and are now published for the following Trades and topics (totaling 9 different programmes):

1. *NZEB Fundamental Awareness*
2. *NZEB for Electricians*
3. *NZEB for Plumbers*
4. *NZEB for Bricklayers*
5. *NZEB for Plasterers*
6. *NZEB for Carpenters*
7. *NZEB for Site Supervisors*
8. *NZEB Ventilation*
9. *Retrofit to NZEB*



1.2. Development of New-Build Dedicated NZEB Contractor Training Centre

In parallel with the drafting of the National Skills Specification described above, WWETB development of a dedicated contractor training facility in Enniscorthy, County Wexford focused on new-build residential construction. This facility, pictured below, consisted initially of a space of approximately 500m². The empty commercial building was completely fitted out as a training centre, with classroom, toilets, multiple training rigs, full-scale airtightness demonstration 'house' and lots more besides.

1.2.1. Expansion of the New-Build Training Facility

Based on the success of the NZEB training centre in the first half of 2019, WWETB decided to expand the facility, doubling its size to include a number of dedicated training rigs focused on ventilation systems and strategies for NZEB homes. The first class was held in this newly extended section in late November 2019. One of the training 'bays' in this extended centre is depicted below, including mechanical ventilation with heat recovery (MVHR).

1.2.2. Retrofit to NZEB Training Centre

The above described training centre in Enniscorthy deals exclusively with new-build NZEB homes. In order to address the need to deal with the scale of the retrofit challenge, WWETB developed a second training centre – focused on retrofitting - in nearby Waterford City (pictured below).

1.3. Roll-Out of Training

1.3.1. NZEB Fundamental Awareness programme

This course has been delivered on 54 occasions between 28th November 2018 and 21st November, with the number of trainees reaching almost 400. MosArt was contracted by WWETB to deliver these programmes.

Youth Training

In response to a challenge laid down by Amina Mohammed, Deputy Secretary General of the UN, in July 2019, WWETB has focused on ensuring that young people get the opportunity of upskilling in NZEB. The photo below depicts one of several classes of apprentices that have availed of the NZEB training provided by WWETB.

1.3.2. NZEB Specialist Courses on Electrical, Plumbing, Ventilation and Retrofit

In addition to the above Fundamental Awareness courses, WWETB provided the four specialist courses listed below, totaling 29 trainees as per the list below:

- ***NZEB for Electricians**, delivered on three different occasions (January, June and October 2019) totaling 16 trainees;*
- ***NZEB for plumbers**, delivered once in October 2019 to 6 trainees;*
- ***NZEB Ventilation**, delivered in November and December 2019 to a peer group of national experts (7 trainees).*
- ***Retrofit to NZEB**, delivered twice in January 2019 to a total of 24 trainees (delivery of the NZEB Retrofit course is being rolled out on a regular basis from December 2019 inward).*

2. Reference to National Centre of Excellence in High Performance Building in National Policy

2.1. Irish Climate Action Plan 2019

*On 1 August 2019, the Irish Government published its Climate Action Plan. This policy document sets out a total of 183 specific 'Actions' with timelines, leads and other key stakeholders. **Action 50** in the Climate Action Plan deals with upskilling of contractors in deep retrofitting and NZEB. Referring to the last row in the excerpt below, the intention to develop a centre of excellence in high performance buildings is highlighted. Reference is made to the UN and an impressive line-up of five Government Departments along with WWETB and Wexford County Council are listed as key stakeholders.*

Listing the centre of excellence in the Government's Climate Action Plan is testament to the efforts expended by the above-mentioned parties in progressing with the UNECE's objective of developing a network of knowledge-hubs globally.

Building the Supply Chain

Action 50: Skill-up current contractors/other industry players in deep retrofit, NZEB and new technology installations

Steps Necessary for Delivery	Timeline by Quarter	Lead	Other Key Stakeholders
Through engagement with the Regional Skills Fora, the identified skill needs for NZEB, deep retrofit, heat pumps and new technology installations along with other identified skills needs in other sectors will be supported across the education and training system, including through relevant apprenticeship programmes	Q2 2019	DES	SOLAS, SEAI, DHPLG, DCCAE
Deliver NZEB training programme for existing construction workers by Waterford and Wexford Education and Training Board	Q4 2019	WWETB	DES, SOLAS
Develop a centre of excellence for High Performing Buildings in WWETB (potentially part of United Nations Economic Commission for Europe initiative). Accredited training programmes developed in this centre to be delivered nationally through the ETB network.	Q4 2019	DCCAE ⁴	DHPLG, DFAT, DES, DBEI, SOLAS, SEAI, Wexford LA, WWETB

2.2. Future Jobs Ireland Plan 2019

Also in 2019, the Irish Government published the Future Jobs Ireland 2019 policy document. An excerpt from the above plan is included below, referencing the intention to develop a Centre of Excellence on High Performance and NZEB Buildings. As with the Climate Action Plan above, this policy reference reflects the quality of work being delivered by WWETB through its NZEB training centres in the southeast of Ireland.

- (ii) Develop a National Centre of Excellence on High Performance and Nearly Zero Energy Buildings (NZEB).
 - a. Establish a National Steering Group
 - b. Deliver NZEB Fundamentals training to over 500 people
 - c. Government to consider the future development of the Centre.

3. World NZEB Forum Presented by UNECE HPB Partner, MosArt

In November 2019 MosArt (one of the founders of the UNECE network of experts in high performance buildings) organized the World NZEB Forum in Dublin. The conference was announced by Minister of Finance Paschal Donohue (pictured below along with some of the MosArt team) at Government Buildings.

Attendance

Attendance at the World NZEB Forum was approximately 350. A total of 25 first-class presentations were delivered running across three different tracks. The first day of this two-day event consisted of site-visits and hands-on workshops which was very favourably reviewed.