



Architecture
Design
Engineering
Urbanism
Sustainability
Lighting
Acoustics

Research and Innovation by BDP

BDP.

About BDP

BDP is a major international, interdisciplinary practice of architects, designers, engineers and urbanists.

We work closely with users, clients and the community to create special places for living, working, shopping, culture and learning across the world.

Founded in 1961, we now have studios across the UK, Ireland, Netherlands, the MENA region, India, and China.

We combine expertise across disciplines, locations, sectors and all major building types to deliver a truly integrated way of working, resulting in high quality, effective and inspiring built spaces.

BDP brings together the major and specialist skills involved in the design of great buildings into a single, managed service.

Research & Innovation Our Collaborative Approach

BDP is passionate about innovation in the built environment. We are committed to continually pushing the boundaries of technical possibilities and our knowledge to maintain our position at the forefront of research and innovation. By conceptualising new and innovative ideas we aim to reduce the environmental impact of buildings, improve internal conditions, and better understand buildings' performance and operation. Our practical and outcome-focused research responds to the complex challenges our clients face, empowering us to devise optimal solutions.

To achieve research and innovation success BDP works in partnership with our network of academic and industrial partners, bringing together high calibre technical specialists to develop inventive, practical and cost-effective solutions to complex problems. We are continually looking to expand our network of partners, allowing us to share the potential and benefit of research strategy, new knowledge and best practice.

Industry and academic research partners include:

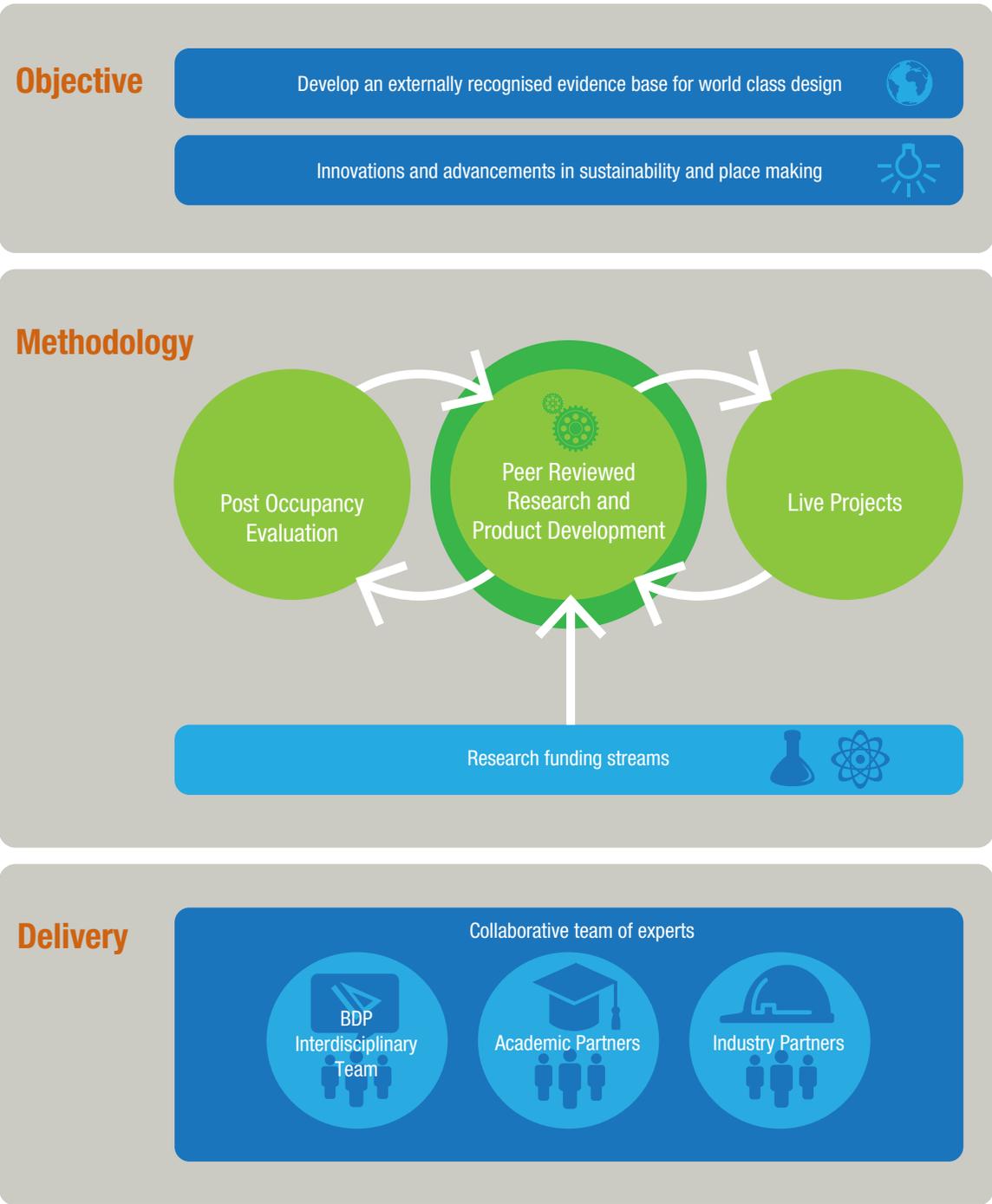
- Siemens
- Ener-G
- The Biospheric Foundation
- Queens University Belfast
- Department of Education and Skills, Ireland
- University of Liverpool
- Future Analytics Consulting
- Selex
- University of Wuppertal
- Tecnalia
- Lonix
- VTT
- Leigh Fisher
- Comune de Genova
- Ayuntamiento de Bilbao
- University of Warwick

Our research offering benefits from our comprehensive project portfolio, providing us with an extensive test bed for innovation in environmental design and construction throughout the entire building lifecycle.

BDP has successfully completed grant funding applications for over £2m worth of grants for research projects aimed at advancing knowledge and technology within built environment design.

BDP approach to R&D

The diagram opposite describes BDP's research and innovation objectives, our methodology for generating and utilising knowledge and our research and delivery project team structure.



What is SUE?

The SUE Lab brings together academic and industry specialists to deliver valuable research and innovation initiatives which will aid our understanding and response in creating Sustainable Urban Environments.

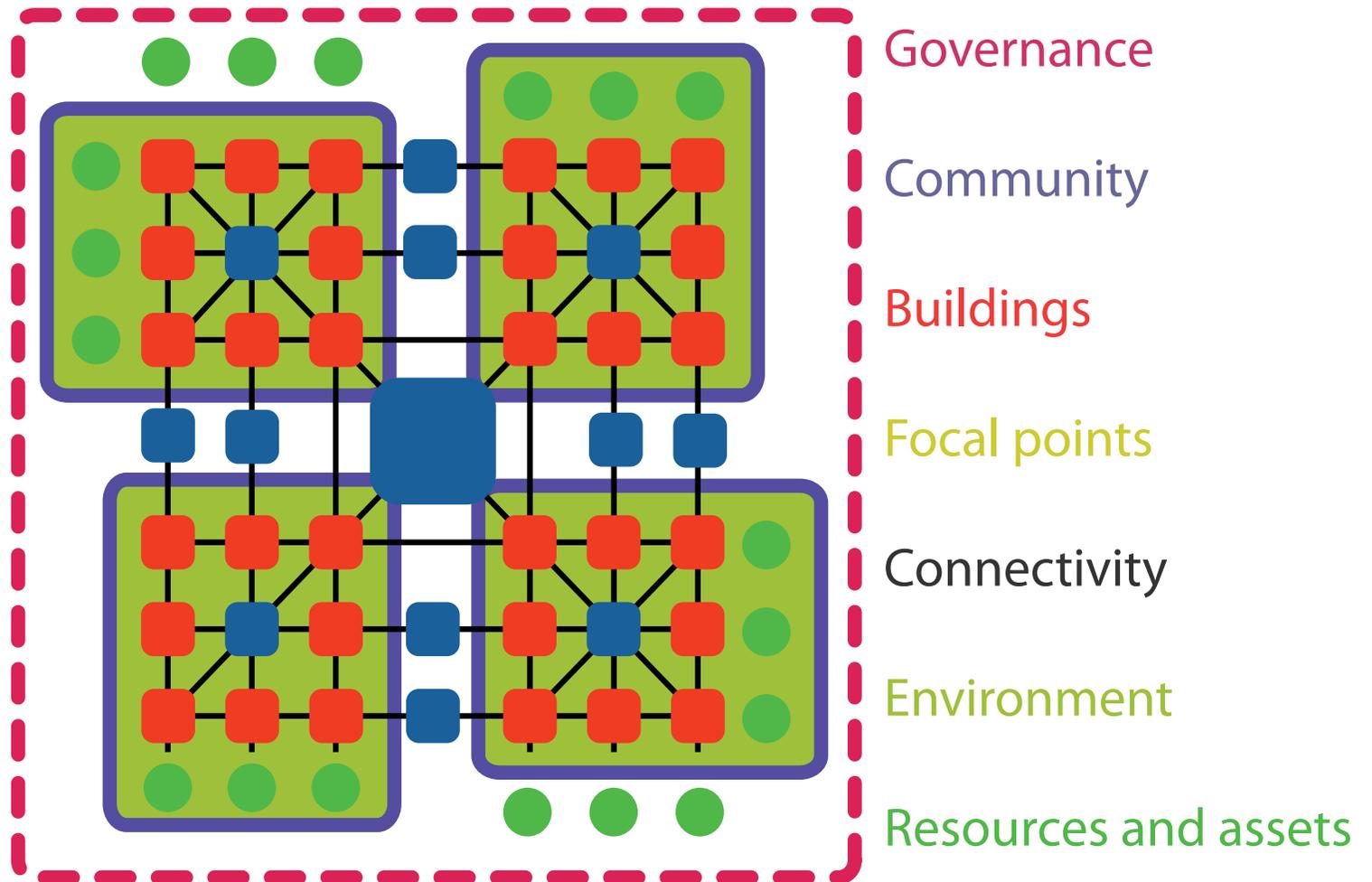
The SUE Lab is our home for innovative research collaboration. It is a vehicle to facilitate the exchange of information, opinion, knowledge and cross industry collaboration to address the issues of urbanisation in the context of environmental, social and economic sustainability.

Individually we can make incremental changes, but the scale of the social, economic and environmental challenges facing our future cities warrants a collaborative effort to achieve a whole system shift.

Further details of SUE can be found at:

<http://sue.bdp.net>

The diagram opposite describes the interconnected nature of the components involved in sustainable urban environmental thinking.



Case study 1



The Biospheric Project and Greenius Façade **What if a green wall... became a vertical farm?**

BDP, together with The Biospheric Foundation and industry partners including Siemens and Ener-G, was involved in developing detailed designs for a 'bio-productive climatic façade' following a successful funding bid to the UK Technology Strategy Board Greenius Awards.

The Biospheric Project was commissioned by Manchester International Festival 2013 to develop an installation for the festival set within a disused Salford mill. The MIF13 installation showcased two indoor aquaponics systems, which use nitrate-rich water from fish tanks to fertilise salad and herb crops, before reusing the water in the tanks.

We provided technical and delivery support to The Biospheric Project in two ways. Firstly we supplied

the technical engineering expertise necessary to deliver the vision for MIF13. Detailed engineering calculations were required in order to adapt safely the disused mill building to support the experimental aquaponic systems. BDP provided structural engineering expertise to ensure that the aquarium could be safely supported on the upper floor of the mill building. Our technical engineering expertise was required to ensure nutrients were effectively transported around the aquaponic system to support fish and vegetation growth. Biological assessment of fish growth rates informed the specification of the aquarium.

To support the initial MIF13 installation, BDP led the research team comprising our engineers, Biospheric Foundation and Queen's University Belfast in developing and testing the world's first bio-productive climatic façade system – a 'Greenius Wall'. The 'Greenius Wall' is a vertical aquaponic farm designed

to maximise urban bio-productivity by using dormant space on the sides of buildings for food growth. The project aims to develop a fully functional vertical farm system which could be replicated on a larger scale in the near future.

Design and analysis of the 'Greenius Wall' demonstrates that the bio-productive façade concept has the potential to make a difference to tackling the challenges of feeding our cities, by utilising the volumes of unproductive façades across our urban environments to reconnect food production with its consumers.

Some of the key advantages of this system include:

- Fresh, local produce - reduce transport emissions 'food miles'.
- Symbiotic, organic system.
- Utilisation of existing, unused façades - regeneration.

- Space efficient - vertical space utilisation reduces footprint.
- Significant reduction in the usage of water (compared to traditional soil methods of growing plants).
- No requirement for artificial fertilisers - organic fertilisers provided.
- No requirement to filter out fish faeces (ammonia) from the system.

Partners	<ul style="list-style-type: none">• Siemens• Ener-G• The Biospheric Foundation• Queen's University Belfast• Solar Glass UK
Commission	<ul style="list-style-type: none">• Manchester International Festival• Salford City Council
Funding	<ul style="list-style-type: none">• UK Technology Strategy Board Greenius Award• Esmée Fairbairn Foundation• People's Postcode Lottery

Case study 2



Irish Schools Energy Research Project

BDP was appointed by the Department of Education and Skills to create an exemplary secondary school that offered an improved standard of internal environment relative to current best practice standards while also offering an improved energy, water, and carbon performance.

We responded to the brief for Colaiste Choilm School with a number of exemplary environmental metrics including:

- Insulation levels to a standard of 50% better than the current Building Regulations.
- An air leakage result of 1.8 m³/m²/hr was achieved which is 64% better than current practice.
- Approximately 50% of the soffit is exposed to maximise free cooling.
- 120m² of photovoltaic panels that provide approximately 14% of the school's electrical energy.
- Night cooling provided through the motorised CO₂ control dampers.
- Heat is recovered from the communications room for building heating.
- Innovative new variable speed pump controls were developed to sense the school's energy load and reduce pumping loads while optimising the CHP unit performance.
- The virtualisation of four servers into a single server, reducing the server energy use to a quarter of its normal value (the total communications room consumption is only 1kW).

BDP's exemplar environmental performance school design is recognised in the following key environmental performance indicators and award achievement:

- The lowest energy secondary school in Ireland.
- The most airtight secondary school in Ireland.
- The first secondary school in Ireland to achieve an "A2" energy rating.
- The largest renewable systems installation of any school in Ireland.
- Irish independent Green award 2012 and best overall green project.

Ongoing Research

Colaiste Choilm school will also be used as a research project to study the potential of various passive and active environmental strategies in secondary schools. BDP is gathering over 10 million data points per year and is analysing the results to determine how real life energy use in schools can be reduced. This project will provide a significant amount of new information on energy usage in modern school buildings and its potential to minimise environmental impact while improving student and staff comfort.

Case study 3



Harmonise

BDP is part of an international consortium that has been commissioned by the EU to undertake a research project that will analyse the issue of resilience in urban infrastructure. Resilience is the ability to withstand and recover from a manmade or natural disaster (e.g. terrorism, major fire, riot, flood, earthquake). By urban infrastructure we mean large complexes of linked urban uses (e.g. train stations, shopping centres, arenas). The aim of the study is to develop a series of tools (e.g. simulations, risk assessments, planning and design guidelines, building codes) within one user friendly web based portal that will aid those who are involved in shaping the urban realm (e.g. planners, engineers, architects) to take a more balanced and holistic

approach to resilience and in turn create better and more sustainable places.

The project will run for 39 months and began in June 2013. BDP's role will be to test the platform on five European case studies that are all at different stages of development. The case studies are More London in Southwark, a proposed transport interchange in Dublin, a shopping / arena development in Tampere (Finland), an existing mixed use quarter of Genoa and a new train station in Bilbao. The case studies will aid further development of the platform, which is followed by a series of dissemination activities including a major conference.

Partners	<ul style="list-style-type: none">• Future Analytics Consulting• Selex• University of Wuppertal• Tecnalia• Lonix• VTT• Leigh Fisher• Comune de Genova• Ayuntamiento de Bilbao• University of Warwick
Commission	HARMONISE (Holistic Approach to Resilience and systematic actions to make large scale urban built Infrastructure Secure)
Funding	European Union

Case study 4



University of Liverpool

Environmental Assessment and Management Research Collaboration

A collaborative research project led by University of Liverpool aimed to explore Environmental Assessment and Management (EAM) related higher education in the UK and its attractiveness and relevance on practice for home as well as international students. As industry partner, BDP undertook a collaborative research exercise with the University of Liverpool and the Environment Agency.

The project's intent was to address four objectives:

1. Identifying current EAM related higher education across universities and colleges in the UK.
2. Exploring student composition of such programmes in terms of their nationality and work experience in a relevant sector.
3. Exploring what makes the EAM related higher education programmes attractive to the current students.
4. Investigating usefulness and relevance of knowledge and skills imparted by EAM related higher education in the UK.

Our contribution to the project included:

- Attending the Ireland-UK IAIA workshop scheduled to be held early 2013 at the University of Liverpool.
- Consultation input during the questionnaire design phase.
- The coordination of a select group of BDP professionals across its different environmental professions in completing a knowledge and skill questionnaire.

Project outcomes

The study identifies gaps in current EAM education by testing the usefulness and transferability of knowledge and skills imparted through such courses on actual practice.

This study establishes the current trend of EAM related higher education in the UK in terms of identifying relevant courses offered in universities/ colleges and also determines the students who undertake such courses with regards to nationality and work experience.

Through a programme of questionnaires, interviews and focus groups the research group accomplished its objectives of identifying and evaluating the state of EAM within Higher Education in the UK. A key outcome of the project was the relationships built between academic and industry partners, providing a platform for future collaborative research in the future.

The findings of the project were presented in the International Association of Impact Assessment (IAIA) Conference held in Canada through a poster which also achieved the award for the Best Poster in the Conference. In addition, a paper was presented in the Ireland-UK Branch Conference organised by the lead academic in the Management School in University of Liverpool.

Future research

Based on this research, it is anticipated that a journal paper will be published in the future co-authored by the lead academic, research assistant and other academics who gave critical guidance on the project. All outputs produced have been and will be acknowledging the support gained throughout the project from the two industry collaborators Environmental Agency and BDP.

Partners	Environment Agency University of Liverpool
Commission	University of Liverpool
Funding	Technology Strategy Board (TSB) Innovation Voucher Scheme

Research and
Innovation
by BDP

BDP.

Steve Merridew

Environmental Design Director,
Head of Sustainability

11 Ducie Street
Piccadilly Basin
PO Box 85
Manchester M60 3JA
T +44(0)161 828 2200
E steve.merridew@bdp.com

www.bdp.com