



Anastasia Cockerill, Stage 6

"When the forest and the city are functionally indistinguishable, then we know we have reached sustainability." ~ Janine Benyus

Regen

Anna Czigler & Ben Bridgens

Setting the scene

Could buildings function like complex ecosystems? Mixed woodland is an example of a dynamic, complex, diverse, multi-functional, resilient, self-sustaining system. In contrast most buildings cannot adapt to changing conditions and requirements, are environmentally damaging during construction and operation, degrade over time, and are difficult to reuse at end of life.

The climate crisis is currently being addressed in most countries by setting goals of achieving 'net-zero' CO₂ emissions. In most sectors, including the construction industry, the approach is to make incremental reductions in CO₂ emissions to achieve net-zero within a particular

timescale. However, incremental improvements rarely result in a significant overall reduction after economic and population growth, and the rebound effect, are taken into account. Carbon dioxide emissions provide a convenient, quantifiable measure of environmental impact: represented by a single number that is easy to measure, incrementally reduce, price and trade. The more complex notion of social, economic and environmental sustainability has been replaced with the simpler task of counting carbon. This ignores a wide range of other negative environmental and social impacts of human activity which are much harder to measure, but just as important to address. If we take a step back from the

incremental race to net-zero and critically examine current practice and emerging trends in the construction industry, do we see sustainable forms of construction emerging? Do we see materials and processes which could continue to be used for hundreds or thousands of years whilst meeting future generations' needs just as well as ours have been met? Do we see buildings which can adapt to changing climates and extreme weather events? Do we see buildings which have a positive impact on the world around them?

This studio will focus on the creative use of materials, understood through the analysis of the geological, ecological, technological and social systems that make up the process from sourcing them to using them and beyond. We will look at strategies to use materials in many shapes and forms: historic, local, high-tech, vernacular, not-yet-existing or repurposed.

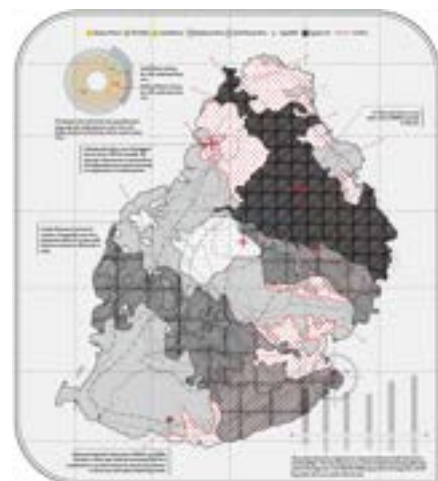
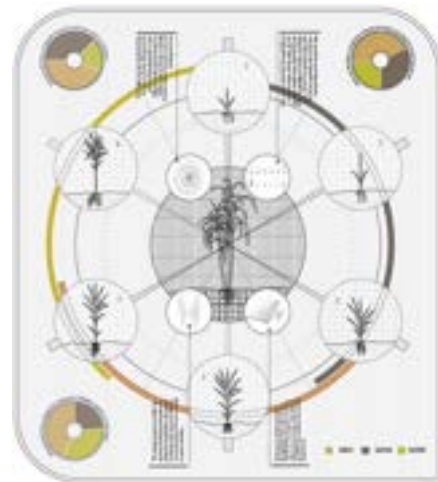
These strategies will be multi-scale throughout the year:

- Regional and urban strategies of sourcing-transporting-manufacturing-building;
- Building scale strategies for selecting, recycling, constructing, adopting, disassembling;
- Product scale ranging from connections to furniture.

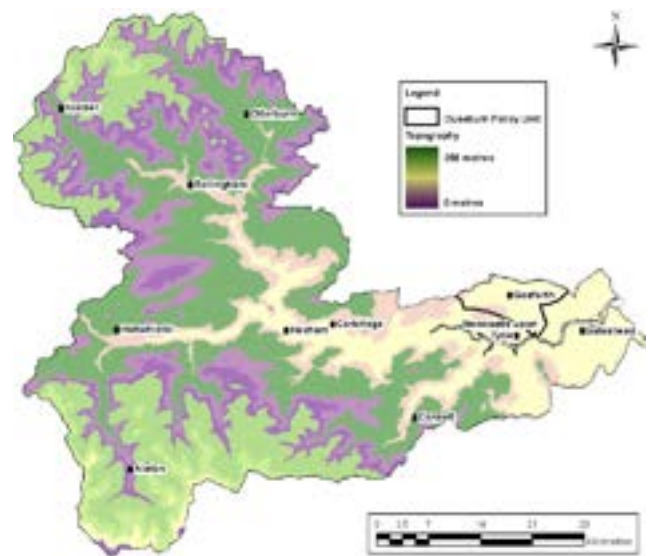
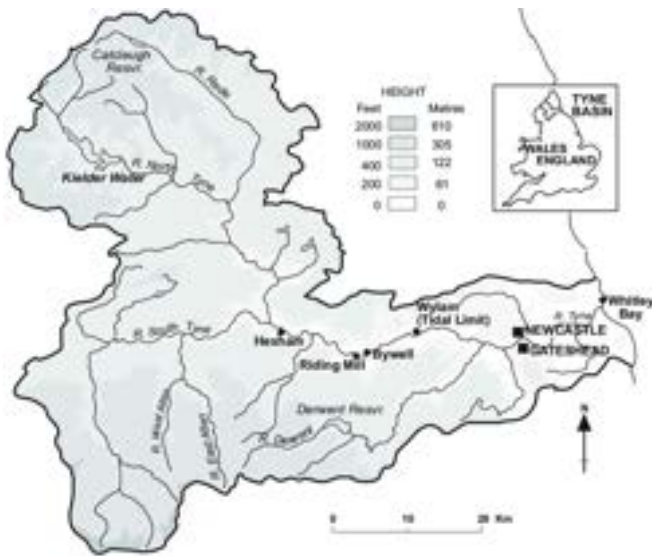
A global strategy of achieving sustainability requires a holistic approach from architects, including a slowly emerging environmental, economic, architectural and social framework to create systems that are not just more efficient than what we have now, but aim to have positive social and environmental impacts. Could we live in what McDonough & Braungart (2013) describe as a world of abundance and delight rather than a world of limits? Such strategies exist and have started

influencing urban and architectural design, construction and even behavioural principles, such as cradle-to-cradle design and regenerative design principles. We will explore these to understand design through a process-oriented systematic approach. These principles call for ways of integrating needs of communities and society as a whole, whilst considering sustainability as part of a wider system of ecological and technological flows.

Our aim is to explore how we can look beyond 'net zero' and create a built environment which positively impacts the environment and society. This will be achieved by creating a new infrastructure for mapping, sourcing, transporting, making, using, disassembling or reusing a creative range of materials.



Sen Mungapen, Stage 6



The Region

Our extended site is the North Tyne and Tyne valley, which begins at Kielder Water - “England’s largest forest and the biggest man-made lake in Northern Europe” - a bleak and beautiful landscape which provides raw materials for downstream industries. Below Kielder’s dam the river passes through remote rural areas and the village of Bellingham, crosses Hadrian’s Wall, and joins the South Tyne near the historic market town of Hexham. From here the river runs east to Newcastle-upon-Tyne, passing areas of industrial production, new residential housing and offices, entertainment and culture, and relics of past industry. About 65 miles after leaving Kielder, the River Tyne flows into the sea at Tynemouth and South Shields.

We will begin at large-scale by mapping and analysing flows of materials, water and energy, whilst considering the interaction of these flows with the region’s history, culture, geography, economy, natural environment and architecture. Through creatively mapping systems and flows around the North Tyne and Tyne rivers and their catchment areas, you will not only identify problems, issues and voids, but also a material which has relevance to these.

These may be conventional building materials, like stone, brick or timber; innovative building materials like mycelium, bacterial cellulose, straw or wool, or not a building material at all, like leather or apples. We will analyse the associated material processes, from the source all the way to construction and beyond to disposal and re-use.

You will consider the local historic, current & future infrastructure to source (mine, cut, grow, create in a lab, import, repurpose) your material, then transport, manufacture, store, assemble and finally construct with them. We are hoping that through your sites and material explorations, our studio will learn together about the variety of processes which underlie our built environment.

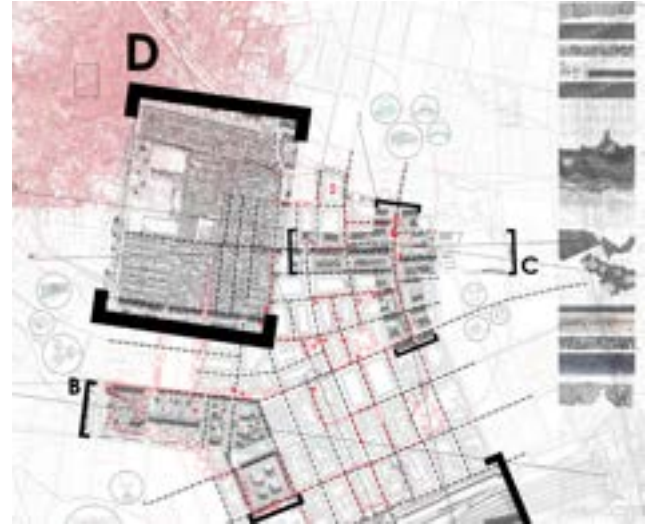
By studying a number of different sites, linked by their situation within the River Tyne catchment area, with ecological, technological and social issues, we will create a network of local solutions to a regional problem.

Studio approach

Our studio will work at different scales of systems thinking; it will be simultaneously large-scale and tectonic. We will look at large rural areas, villages, towns and cities and their regional material flows through systems mapping while understanding that we as designers can influence these systems through material selection and application. Cities and large-scale rural regions, with their confluence of economy, ecology, built environment and society are testing grounds for our premise of creating a new system-based approach to material use.

We will look at building systems from a material point-of-view as well, to investigate how these can positively enhance their environment, while our material investigations lead us to creating potentials for new building typologies.

Ben Bridgens leads the Hub for Biotechnology in the Built Environment (HBBE, www.bbe.ac.uk), providing the studio with opportunities to engage with novel biomaterials and biological processes and their potential applications in architecture. The HBBE is a collaborative research centre which brings together bio-scientists from Northumbria University with architects, designers and engineers from Newcastle University. The HBBE is developing and designing with biotechnologies to create a new generation of 'Living Buildings' which are responsive to their natural environment; grown using living engineered materials, metabolise their own waste and modulate their microbiome to benefit human health and wellbeing. The HBBE has facilities to enable large scale material experimentation and prototyping, which will be available for this studio.



Lewis Lovedale, Stage 5



Responsive wood composites, A. Holstov and B. Bridgens



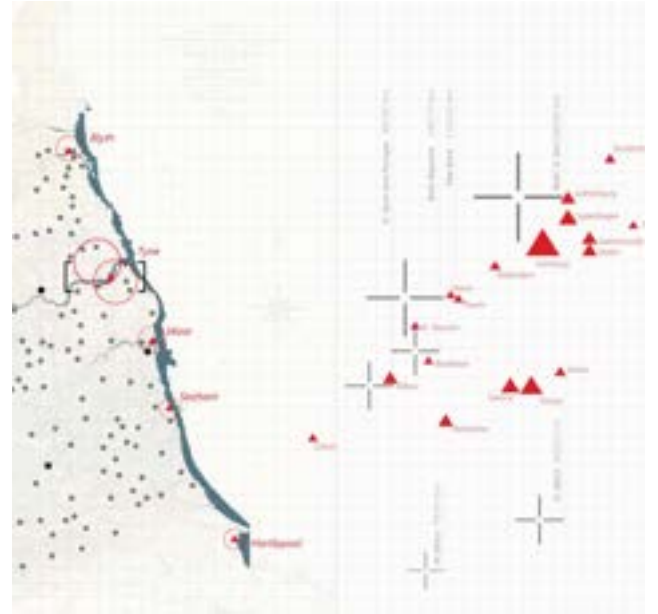
The Living Room at the Farrell Centre, B. Bridgens and J. Scott



BioKnit prototype, mycelium and knitted textile, J. Scott

Studio themes

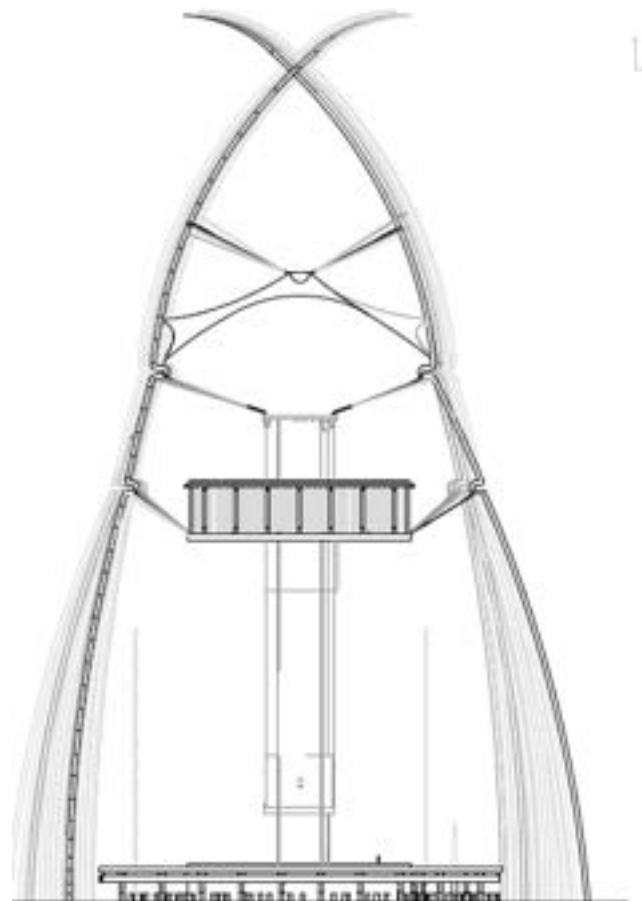
Urban / Rural systems: when we look at cities or entire regions, we can see the intertwining and complex organisation of the built environment, ecology, transport, energy, water, food and social systems. We will look at these with a special focus on the building fabric, ecological systems and their regeneration, food systems that can nurture these large areas, and the social systems that enable change towards a more sustainable (or regenerative) urban or rural environment. **We will think in terms of systems and flows to better understand the complexity of these large-scale environments.**



Katherine Bluff, Stage 6

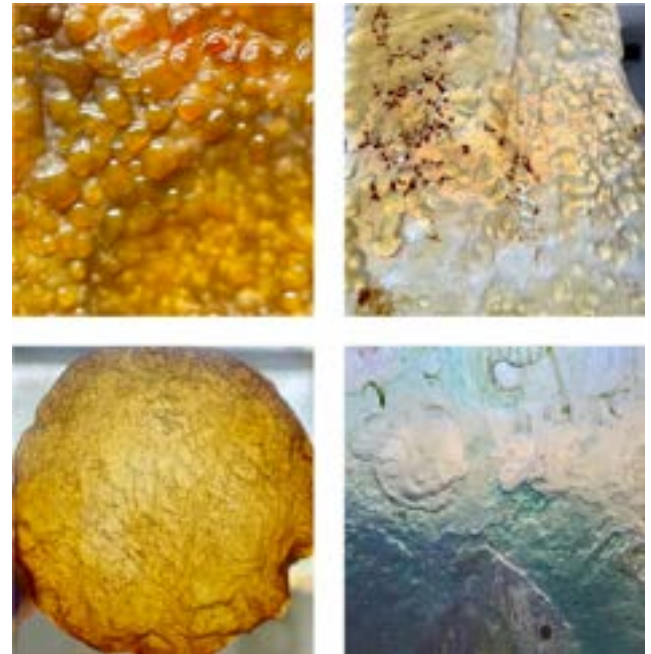
Regenerative architecture: how does the building typology, fabric and systems enable the building to make a positive contribution to its environment? Does it produce more energy than it uses? Does the building help restore natural ecosystems? Does the building respond to its environment to minimise energy use? Will the building feed its occupants and provide them with clean water? Will the building adapt to changing climatic conditions?

Our studio will explore the design of buildings which positively interact with the systems around them, and are responsive, resilient, dynamic, self-sustaining and adaptable.



Janet Tam, Stage 6

Materials of renewable source: when we think of a renewable, sustainable building material, we mostly think of timber. In this studio, we will look at traditional (textiles, leather, timber, etc.) and innovative materials (made from food waste, mycelium, straw, etc.), that can be grown, used and reused, recycled or even composted. We will learn about these unfamiliar materials through hands-on material making and testing. Going beyond simple material substitution, we will consider how material choice can fundamentally influence architectural design. **Our studio will look at creatively using materials that are non-harmful, locally sourced where appropriate, from renewable feedstock where possible, and can be recycled or reused.**



Heather O'Mara, Stage 6

Urban Mining / Design for Disassembly / Material Banks / Building Reuse

Existing buildings which are demolished can be regarded as material 'mines', but often material reuse does not fit with current design and construction practice. How can we design to accommodate local availability of 'waste' materials? And how can we 'design for disassembly' so our buildings are the materials banks of the future? This involves selecting the right materials, thinking of adaptability and modularity and choosing appropriate connection details. And of course, we must question the need for new buildings; can we adapt and reuse existing buildings?

We can think of building materials and components as borrowed and stored instead of permanently acquired and then disposed of. Our designs will minimize environmental impact (and economic value) by using any or all of these design strategies.



George Spendlove, Stage 5



Hoi Wong, Stage 6

Building typologies: many traditional building typologies are associated with our research, but there are also new ones being generated through the emerging approach of the design-use-reuse cycle. More local production will require maker-labs (making, repairing, sorting, distributing), communal urban factories, local nutrient flows, collection infrastructure, collective resource banks, digital services and communication centres. Communities can connect through sharing rather than owning, creating new public spaces along the way.

Our investigations will consider traditional and emerging infrastructural and building typologies, suited to individual research topics.



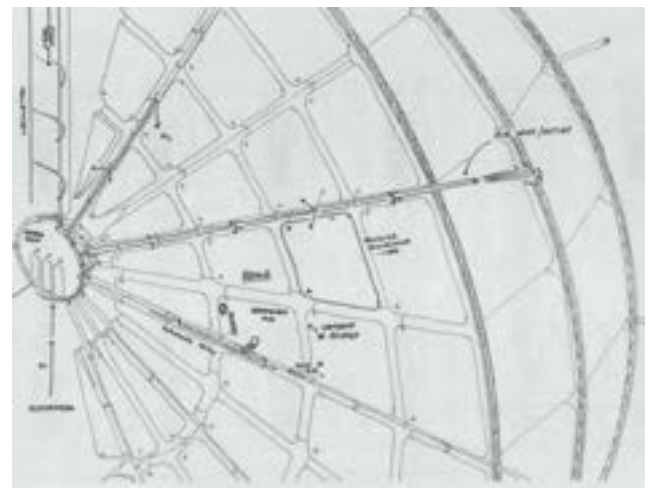
Shivani Patel, Stage 6

High-tech or low-tech fabrication? An urban environment that is designed in a modular and flexible manner can enable rapid assembly, adaptation and disassembly. Open-source digital manufacturing platforms enable ease of design, fabrication, assembly, disassembly and reuse. Conversely, on-site construction by individuals enables the use of local materials, creates local jobs in rural areas with skills passed on from one generation to the next, allows the building design to be adapted depending on material availability, and provides scope for self-build and community build projects.

You will consider and justify whether your project will benefit from high-tech or low-tech construction methods, or a combination of both.



Roxana Caplan, Stage 5



Jacob Botting, Stage 6

Studio structure

Group work: In the initial research phase students will work together in small groups. Beyond this, we are open for students to work individually or in small groups on their research, experimentation and design (*with the exception of Stage 5, Semester 2, for which students must produce an individual comprehensive building design*).

Semester 1, Phase 1. SYSTEM MAPPING:

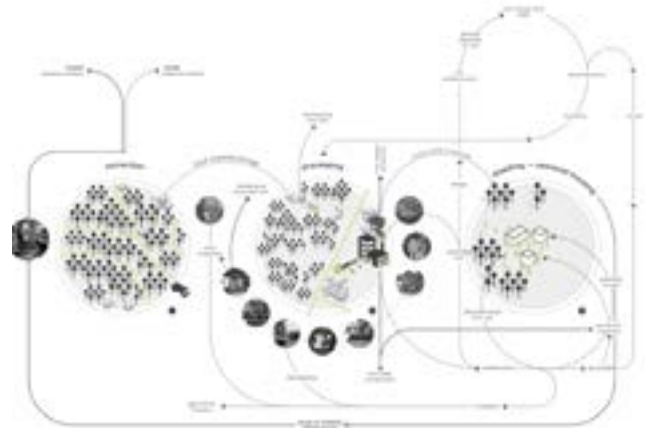
We will start the semester by looking at our bio-region in groups and map its flows of materials, water and energy, whilst considering the interaction of these flows with the region's history, culture, geography, economy, natural environment and urban identities. Through this exercise, individual or group materials will emerge – they will be related to problems and issues you discover through your regional mapping. The next level of system mapping will be that of material processes, from the source to construction and beyond to disposal and re-use - the entire assemblage of components that interact and influence each other.

Studio Trip:

We will take a 3-day trip to explore our region, from Kielder Water all the way to Tynemouth and South Shields.

Semester 1, Phase 2. MASTERPLANNING:

Our large scale urban or rural strategies will emerge from our reaction to the researched area and its associated material systems. By the end of the semester Stage 5 students will have a detailed enough master plan to site their building proposal in the second semester.



Martina Hansah, Stage 5



Irene Dumisratscu – Podogrocki, Stage 5



Xueqing Zhang, Stage 5

Semester 2. Phase 4.

Stage 5: MATERIAL APPLICATIONS:

Students will focus on developing part of their large-scale urban strategy into an architectural design, focusing on a complex building structure, taking into account their specific response to our investigation into material flows. Careful structural and environmental design will be complemented by principles of regenerative design while caring not just for the materials' technical properties, but also their atmospheric qualities. The chosen site for the project may contain some existing building fabric, which can be re-used in-situ or used as a source of materials.

Stage 6: THESIS EXPLORATIONS:

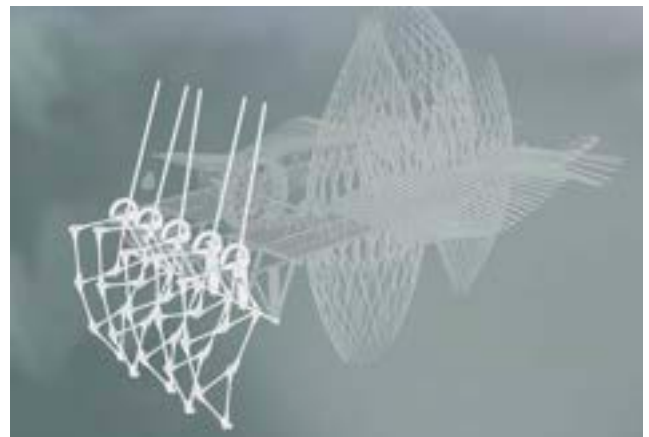
Students will undertake an open exploration into any aspect of their research from the previous semester, at any scale and beyond the original region we explored if desired. These could range from a deeper or multi-level investigation into a rural or urban system; representational strategies for the complex nature of urban flows; large scale installations; research, development and testing of novel materials; a future-based scenario; to a building, room or furniture scale design project.

Studio Specific Criterion:

How creatively has the proposal used rural or urban systems and materiality as research and design tools? Was the complexity of ecological, technological and social flows at a region/city scale addressed? Were regenerative design principles considered throughout the project?



Arthur Belime, Stage 5



Anastasia Cockerill, Stage 6



Simon Ng, Stage 6

Reading list

- Arup: The urban bio-loop / Growing, making and regenerating
<https://www.arup.com/perspectives/publications/research/section/the-urban-bio-loop>
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- <https://en.wikiarquitectura.com/building/swiss-sound-pavilion/>
- <https://circularports.vlaanderen-circulair.be/en/building-blocks>
- <https://www.fabrications.nl/portfolio/>
- <https://www.architecturalectologies.cca.edu/student-research/city-of-disassembly>
- <http://turntoo.com/en/>
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- <https://www.nweurope.eu/projects/project-search/fcrbe-facilitating-the-circulation-of-reclaimed-building- elements-in-northwestern-europe/news/reuse-toolkit-material-sheets/>
- <http://www.designandarchitecture.net/project/1526017753>
- https://www.materialepyramiden.dk/?utm_medium=website&utm_source=archdaily.com
- <https://emergencemagazine.org/essay/navigating-the-mysteries/>
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- <http://katiepaterson.org/>
- <http://www.visitkielder.com>