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Constraints and opportunities for use of timber in Olympic venues

Building with timber for 2032 and beyond

Toby Hodsdon | Associate Principal

22 August 2023

Our firm

ARUP

Dedicated to sustainable development, Arup is a collective of 16,000 designers, advisors and experts working across 140 countries. Founded to be both humane and excellent, we collaborate with our clients and partners using imagination, technology and rigour to shape a better world.

Host city and major event global expertise

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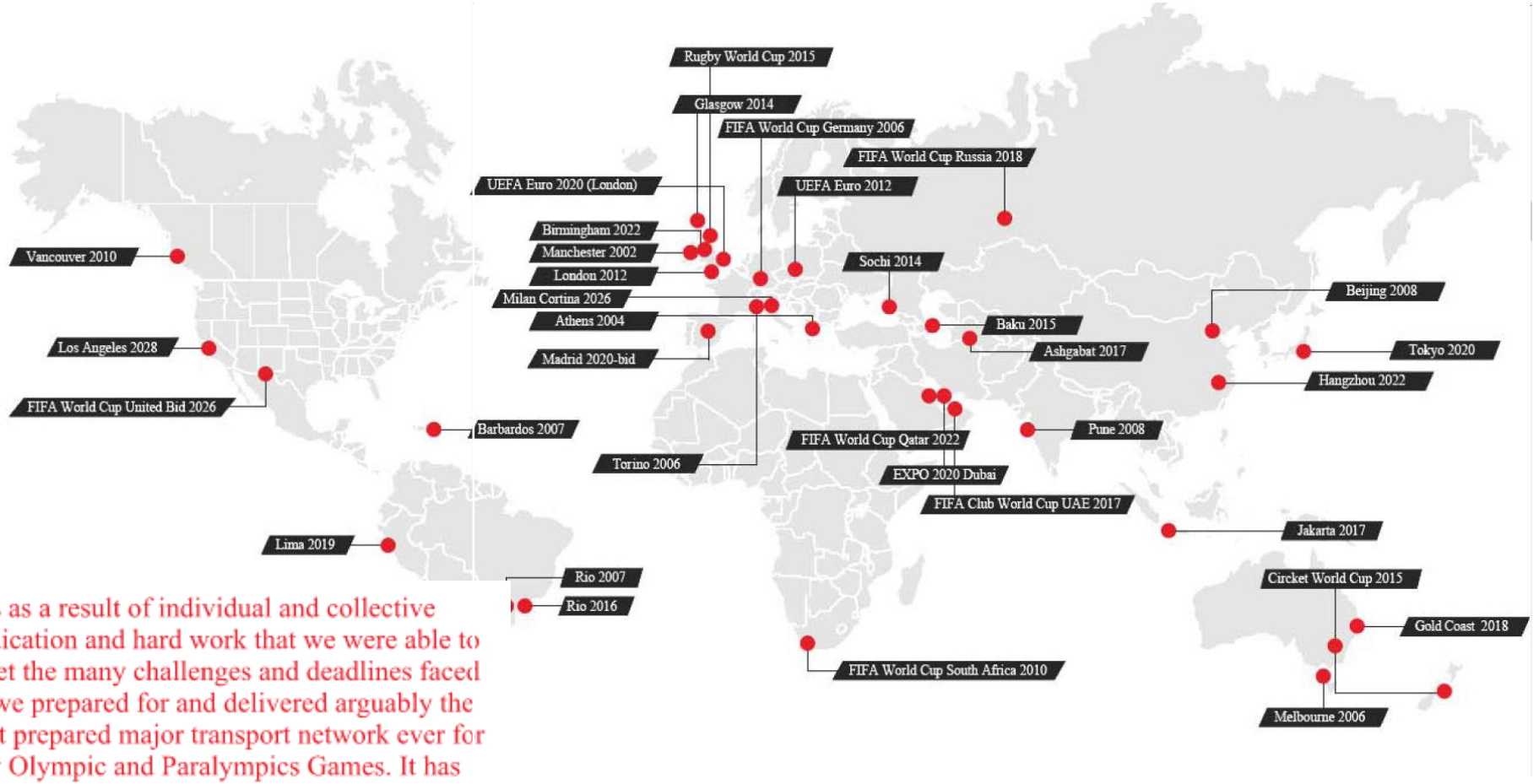
Arup has been actively involved in the strategic masterplanning, operational and overlay design and delivery for some of the biggest sporting events around the world.

Our team's collective major event experience includes:

– United 2026 FIFA World Cup Bid Team
– Birmingham CWG 2022
– Los Angeles 2028 Olympic bid
– Qatar 2022 FIFA World Cup
– Tokyo 2020 Olympic & Paralympic Games
– Lima 2019 Pan & Parapan American Games
– Rio 2016 Olympic & Paralympic Games
– Baku 2015 European Games
– London 2012 Olympic & Paralympic Games
– Beijing 2008 Olympic & Paralympic Games
– Pune 2008 Commonwealth Youth Games
– Rio 2007 Pan & Parapan American Games
– Turin 2006 Winter Olympic & Para Games
– Melbourne 2006 Commonwealth Games
– Athens 2004 Olympic & Paralympic Games



"It is as a result of individual and collective dedication and hard work that we were able to meet the many challenges and deadlines faced as we prepared for and delivered arguably the best prepared major transport network ever for any Olympic and Paralympics Games. It has been an absolute pleasure to work with such a professionally capable and determined team of individuals."

Bayo Dosunmu
Head of Transport Planning, Olympic Delivery Authority
Project: London 2012 Olympic and Paralympic Games

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Today’s journey and our legacy

Olympic share

Timber venues

What does a Timber 2032 look like?

Impact on Queensland

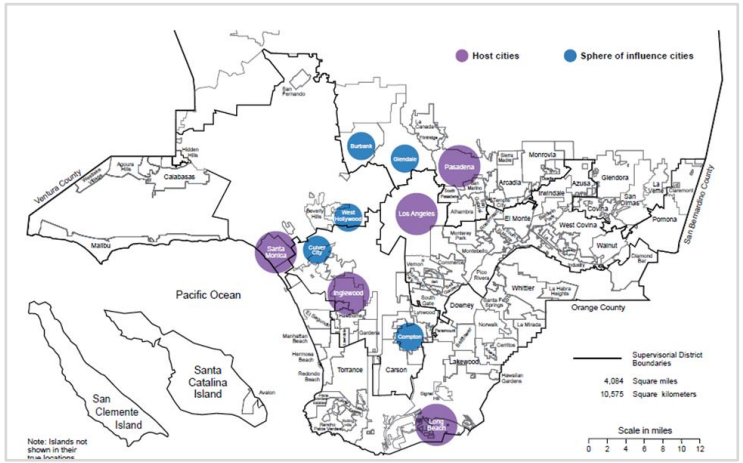
Next steps

Global influence, reach and reputation

Regional trade, economic development and investment promotion

London 2012

- Creation of new urban district
- Mixture of commercial, leisure and retail uses
- Attracted major global arts and educational uses.



Los Angeles 2028

- Use of existing venues
- Opportunity for economic development, investment and growth in adjoining urban areas.

Brisbane 2032

- Showcase Queensland to the world
- Invest for transformational change
- Carbon net positive
- Use existing infrastructure
- Celebrate First Nations peoples
- **Catalyse use of timber in State?**

Distinctive sustainable façade

National Aquatics Centre (Water Cube), Beijing, China

17,000
seats and facilities for spectators

20%
of solar energy is trapped and used for heating

Iconic piece of legacy infrastructure

Anna Meares Velodrome, Brisbane, Qld

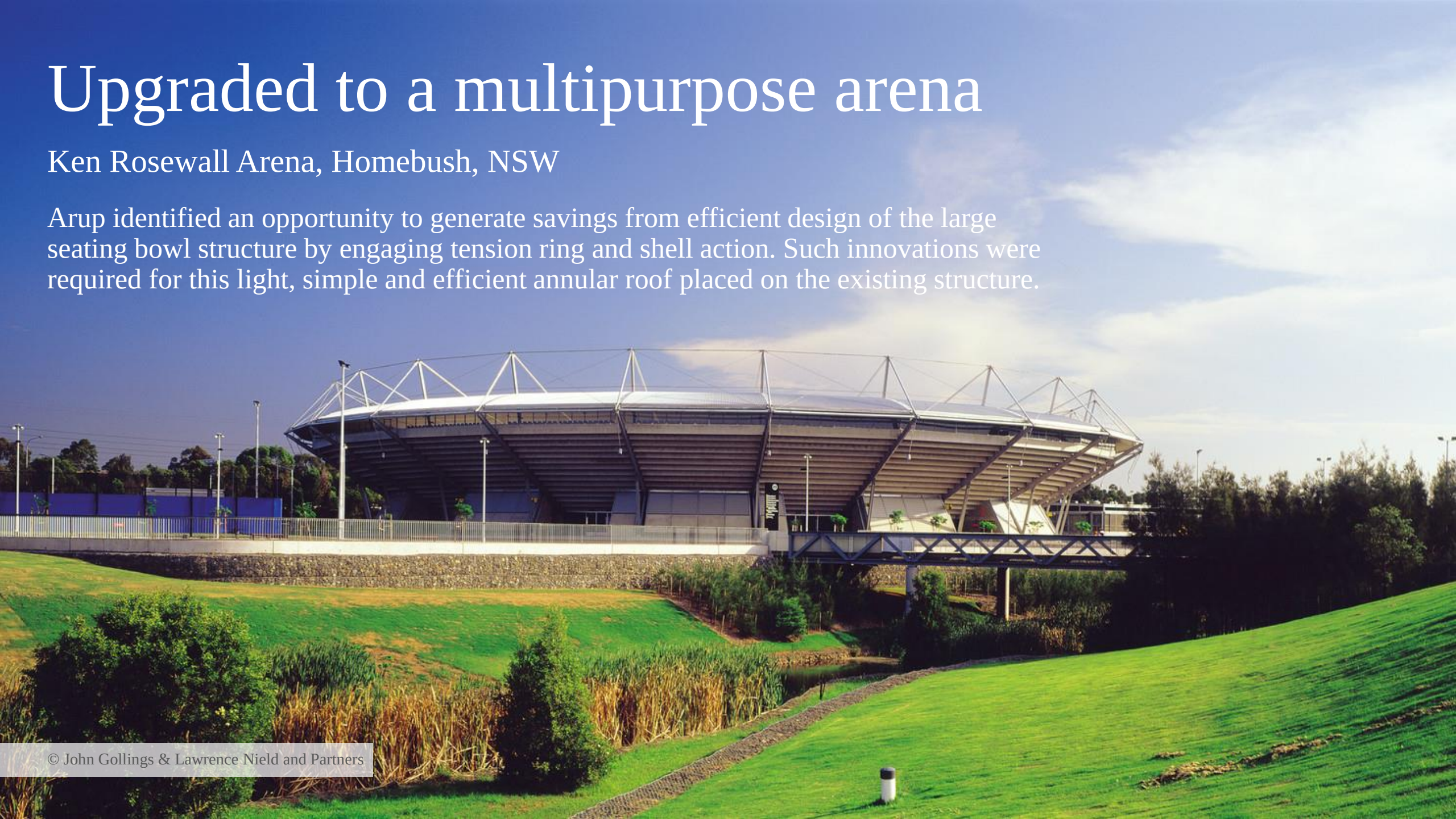
118m

roof span between supports, making it one of the largest clear-span roofs in Australia.

Upgraded to a multipurpose arena

Ken Rosewall Arena, Homebush, NSW

Arup identified an opportunity to generate savings from efficient design of the large seating bowl structure by engaging tension ring and shell action. Such innovations were required for this light, simple and efficient annular roof placed on the existing structure.



Delivered to a tight program

Suncorp Stadium, Brisbane, Qld

52,500
seating capacity

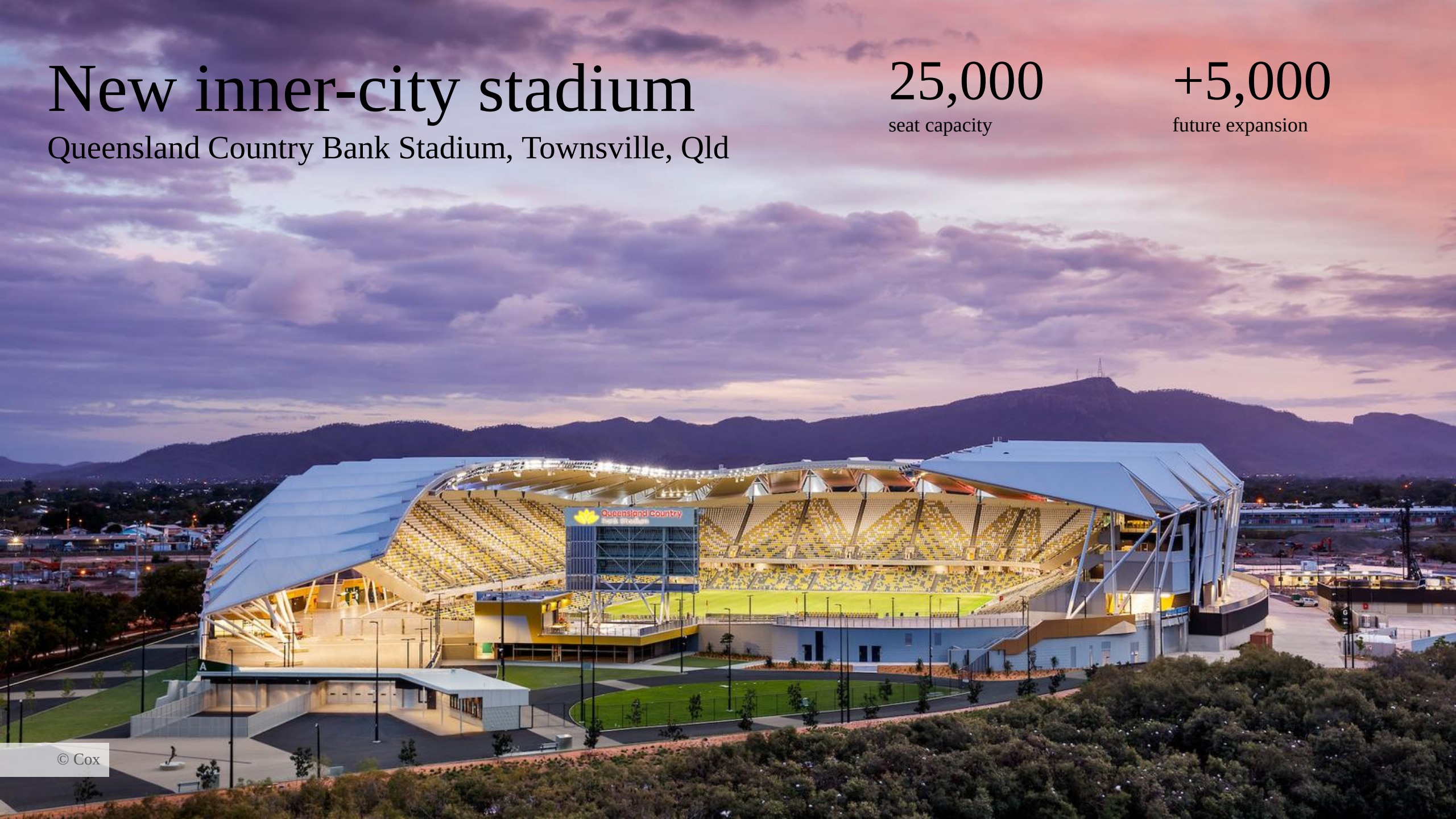
Arup achieved significant cost savings by developing unique composite steel and concrete grandstand structures

New inner-city stadium

Queensland Country Bank Stadium, Townsville, Qld

25,000
seat capacity

+5,000
future expansion



International sporting venue

Gold Coast Aquatic Centre, Gold Coast, Qld

12,500

temporary seats provided for Gold Coast 2018 Commonwealth Games™

Also delivered for 2014 Pan Pacific Swimming Championships

Fast-tracked delivery

Metricon Stadium, Gold Coast, Qld

Solar panelling will generate about

275,000kWh

of electricity a year, making it the largest installed solar power plant in the Southern Hemisphere.

Long span timber for energy efficiency

Royal Agricultural Society Exhibition Halls

22,000

Square metres of exhibition space for the 2000 Sydney Olympics

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Our Olympic share

What have we learned?

- Importance of putting legacy first – in design and planning
- Sustainability matters. Façade, systems and PVs only get you so far.
- Timber technology is proven, and is nothing new for Olympic venues.
- Design needs to focus on program, construction and buildability.
- Venues are multi-modal, but will be altered and amended. Operational aspects drive what is possible.
- Sports events have impacts on construction industry, before *and* after. Therefore, our legacy is not just our venues.

Our Olympic share

Will timber help us?

- Helps meet sustainability targets
- Suitable for newbuild and upgrades
- Lightweight, suits future alteration and amendment
- Prefabrication and off-site manufacture achieves quality
- Can increase speed of construction
- Manage supply chain risks
- Offer lasting legacy if we can increase capability and capacity in Qld.

Timber venues

How might we use timber?

Elizabeth Line, London, UK

Timber venues

Eric Tweedale Stadium, Sydney, NSW

$11.3 million
stadium features a glulam timber roof

8m cantilever for solar shade

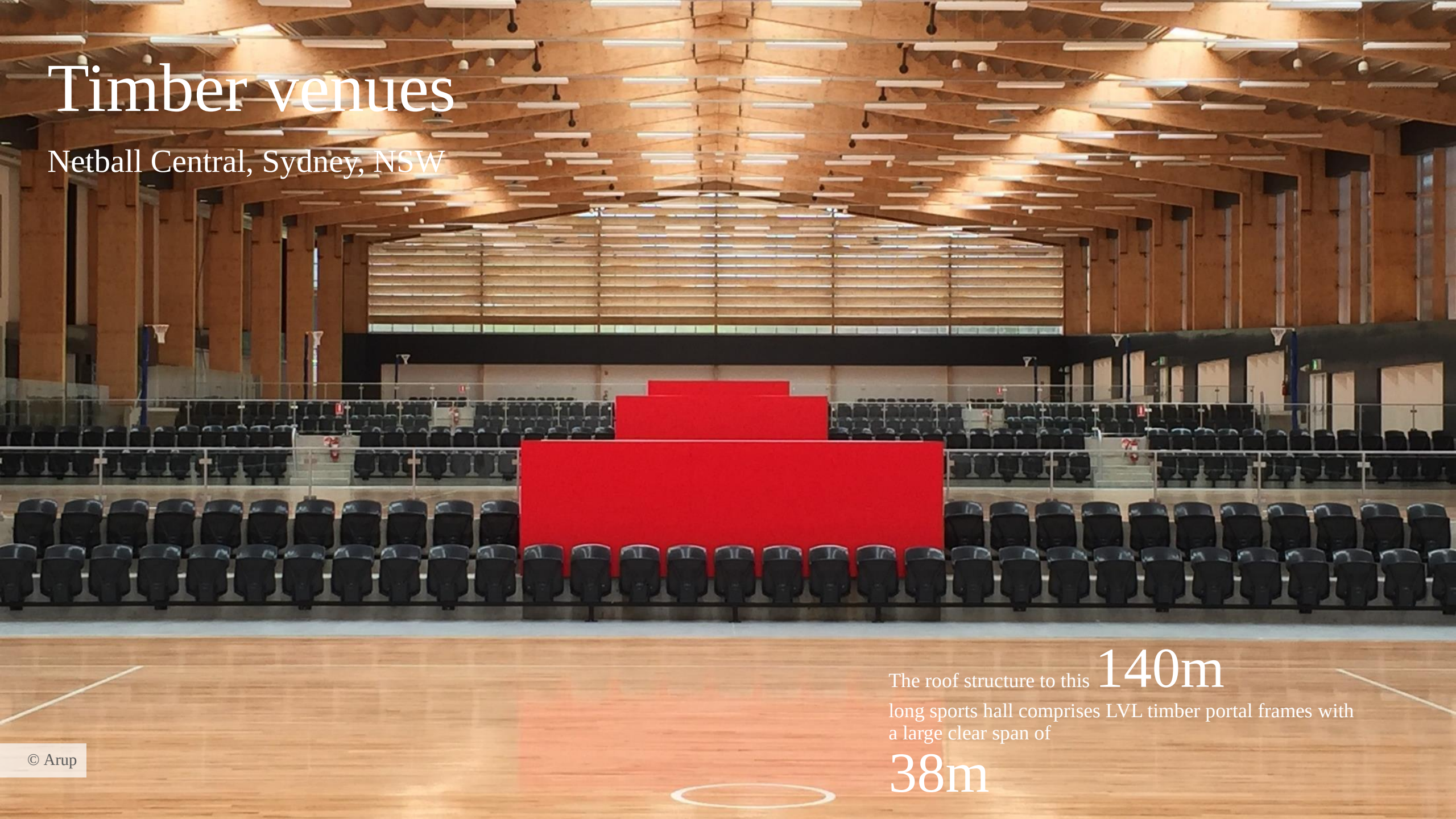
Timber venues

New Performing Arts Venue, Brisbane, Qld

The CLT structure provides 1,500 seats in the venue within a large clear span of 30m

Timber venues

Netball Central, Sydney, NSW



The roof structure to this **140m** long sports hall comprises LVL timber portal frames with a large clear span of **38m**

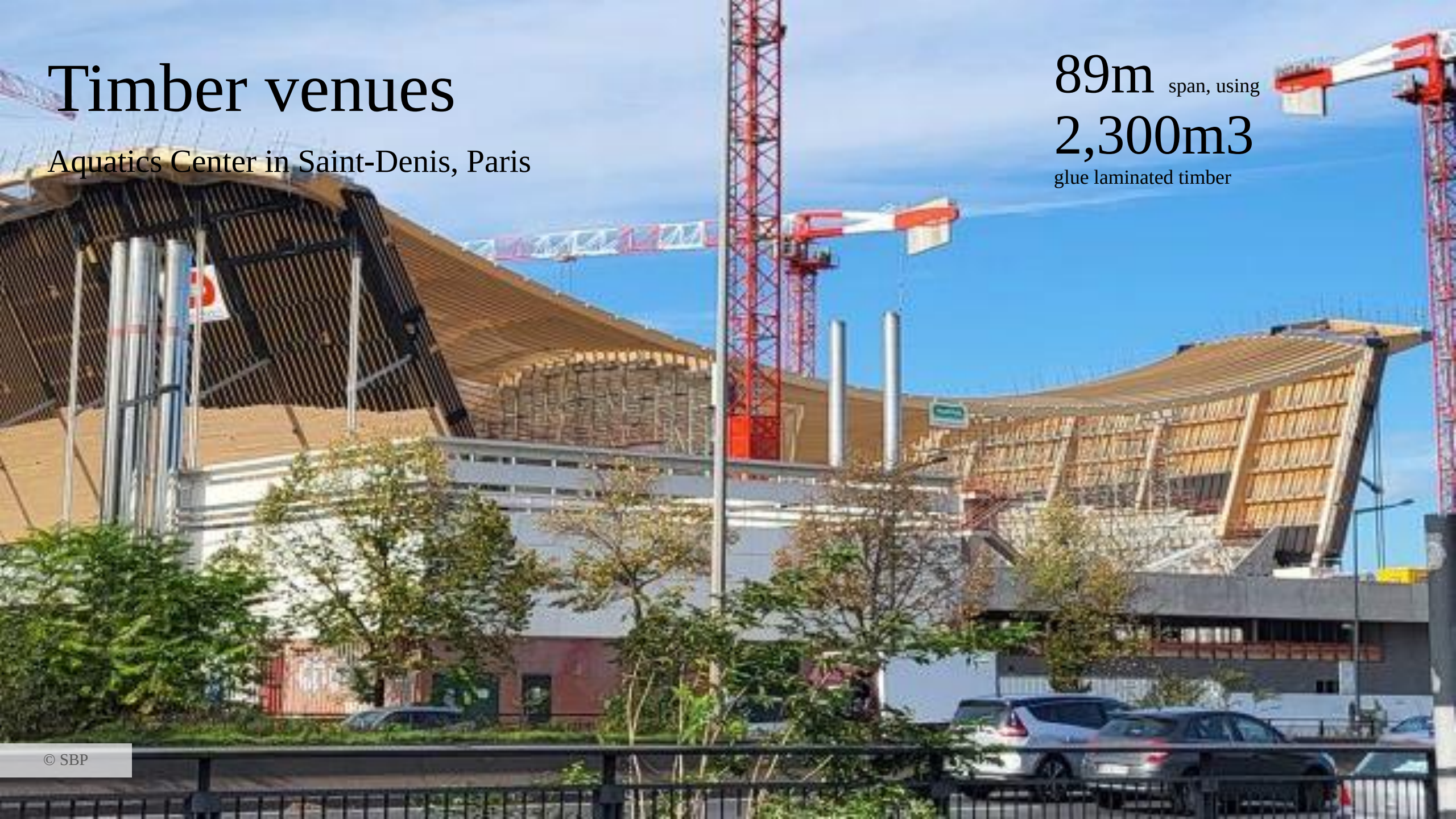
Timber venues

Aquatics Center in Saint-Denis, Paris

89m span, using

2,300m3

glue laminated timber



Timber venues

Believe in Better, BSkyB, UK

3,000m2

building using glulam frame
and CLT cores and floor slabs

Tall Timber

HAUT, Amsterdam, Netherlands

21 stories in Amsterdam where there is goal of building

1 in 5 residential buildings using timber

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Building with timber for 2032

What are the possibilities? The *direct* applications to 2032?

- Brisbane Arena – seating plats for internal applications
- Multi-storey stands, e.g. Arena, Sunshine Coast – potential hybrid timber options
- Small venues, e.g. Barlow Park – shades and roofs like Eric Tweedale
- Larger venues, e.g. Chandler – long span timber roofs like Paris
- Olympic athlete village – multi-storey residential
- International Broadcast Centre – wide range of applications
- Also
  - Temporary stands, bleachers
  - Ancillary buildings, kiosks

Timber 2032

What are the challenges?

- Timber has structural limitations for long spans and durability limitations for exposed locations
- Structural timber can have a small cost premium in current market
- Concern for the capacity of local market and trades, competitve tendering
- Limited knowledge of clients, specifiers, trades, contractors and building owners
- Concern over lead-times and environmental impact for international supply
- Insurers concern for moisture ingress and fire risks on site

Netball Central, Sydney

Timber 2032

How can we reap the benefits?

- Savings from use of timber arise from savings in time
- Prefabrication and offsite manufacture
- Use of BIM and digital tools
- Designing for manufacture (DFM)
- Early contractor involvement is effective – requires different procurement routes
- Detailed logistics and planning

➢ Achieve more, with fewer site personnel

➢ Optimised through collaborative consideration of design and construction

Timber 2032

What else do we have to think about?

- Environmental benefit is common driver – and is now necessary for 6* Green Star
- Appearance can be attractive – but can be a challenge to expose all timber
- Fire performance is crucial
- Durability a consideration – but key is to manage water on site and in building
- Procurement is best through ECI or nominated sub-contractor – can be an obstacle

➢ The industry has the technical skills

➢ Needs collaboration and engagement

Timber 2032

And what about fire?

- Timber structures can be designed for compliance with NCC
- Timber chars when exposed to heat. Char protects and insulates the timber inside.
- Compliance pathways often uses sprinklers, fire protection and fire engineering methods.
- Issues of penetrations, connections etc.
- Multiple fire compliance pathways but unclear testing requirements

- ➢ We have the knowledge
- ➢ The industry can serve projects better

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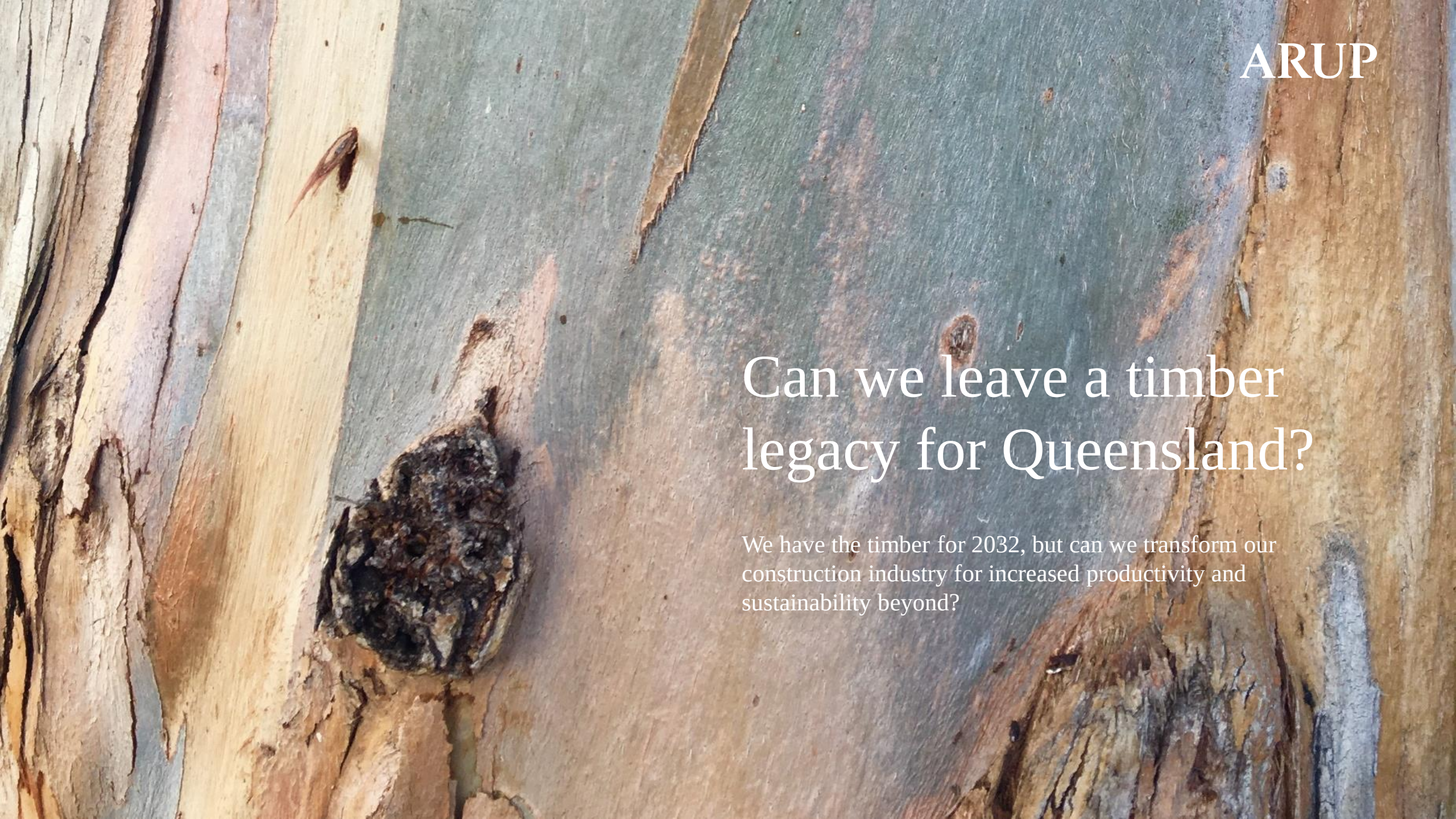
Timber 2032

What would help us bring Timber projects to fruition?

- Ensure timber solutions considered for all schemes
- Allow timber-friendly procurement routes, e.g. nominated sub-contractors
- Ensure we consider program savings for timber projects
- Clarify routes to compliance and testing for QFES, QR, DTMR approvals
- Prepare guidance on equivalence for certifiers, for overseas supplied material

➢ Is this the best legacy for Queensland?



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Can we leave a timber legacy for Queensland?

We have the timber for 2032, but can we transform our construction industry for increased productivity and sustainability beyond?

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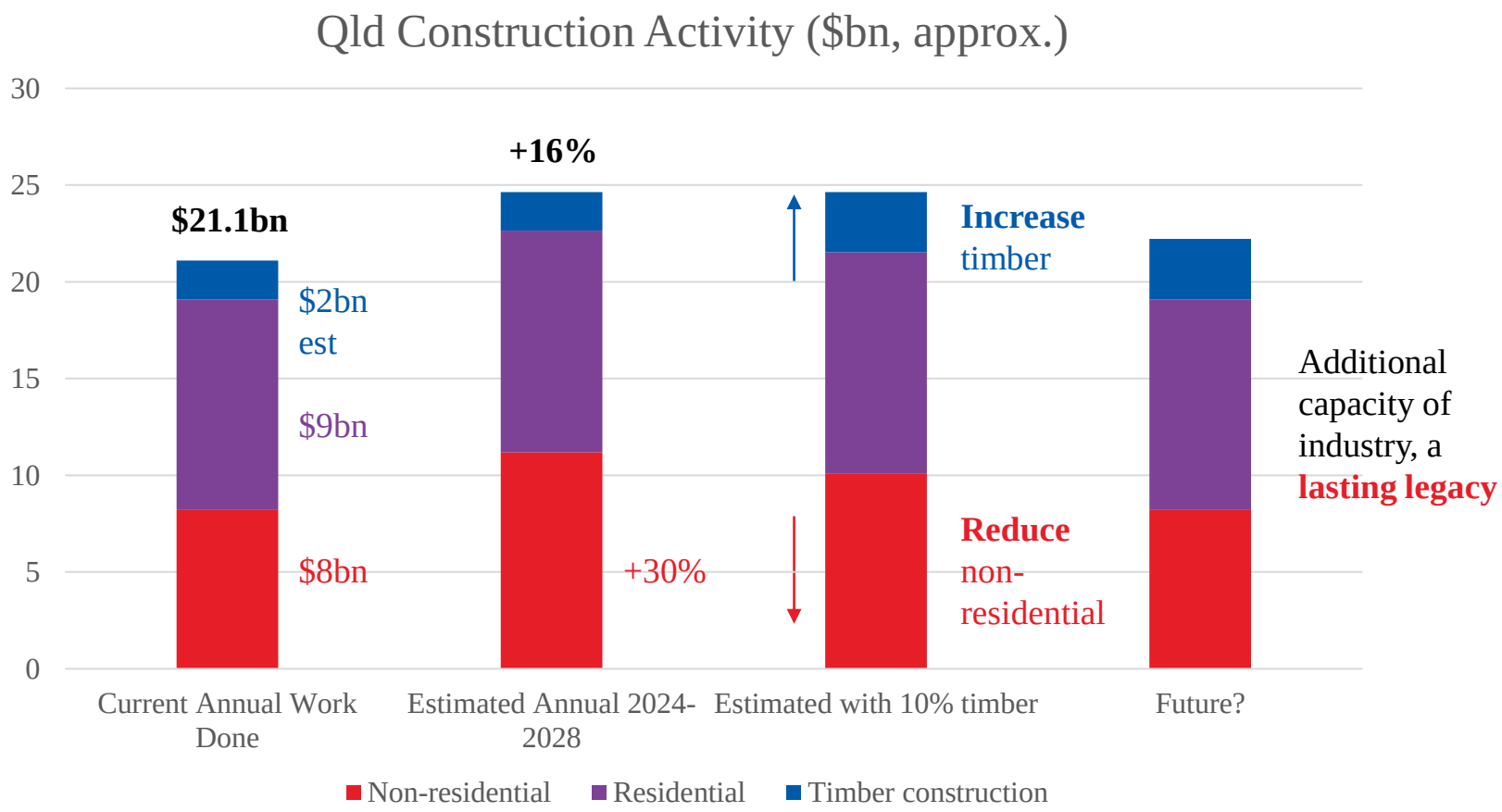
Impact of the Olympics on Queensland

Substantial increase in construction spend

- Currently $21bn construction work done per year in Qld
- Additional ~$3bn per year due to 2032 and health capital infrastructure
- **16% increase** which will fuel inflation, skills shortages
- What if we build **10%** of all new capital works in timber?
- Can we reduce demand on conventional methods, and catalyse growth in timber?



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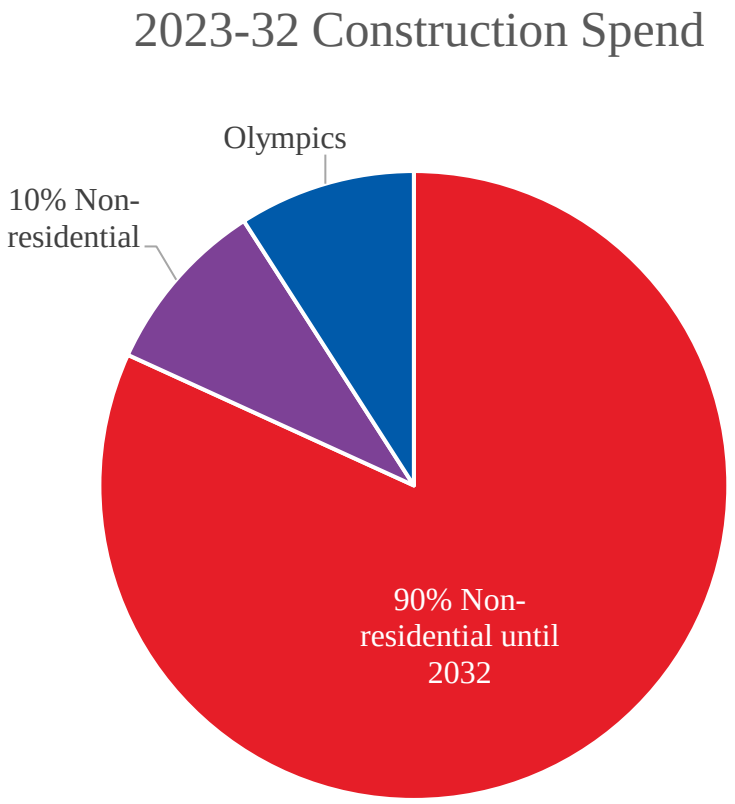
Impact of the Olympics on Queensland

Mitigate risks and catalyse growth

- Olympic spend is equal to annual output for non-residential construction in Qld
- Over 10 years, we will spend 10x Olympics on non-residential construction
- If we build 10% of *all* construction out of timber, it would be the equivalent of building the Olympics *wholly* of timber!

➢ The best legacy is a construction industry that readily utilises timber in construction well after 2032.



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Building with timber for 2032 and beyond

What are the possibilities?

- Transport projects and terminal buildings
- Ancillary and storage buildings for hospitals
- University buildings
- Social housing
- Parkland structures and amenities
- Fire stations

➢ Scope of ***indirect*** applications is greater than ***direct***, and ***after*** the Olympic games, rather than ***before***.

Maryborough Fire Station, Qld

Timber 2032

What could it mean?

- Control cost escalation and labour shortage issues
- Supports growth and adoption of modern methods of construction in Queensland
- Increase productivity of construction industry
- Distribute benefits around regional Queensland

➢ What if agro-forestry industry offer **carbon credits** to Olympic venues..?

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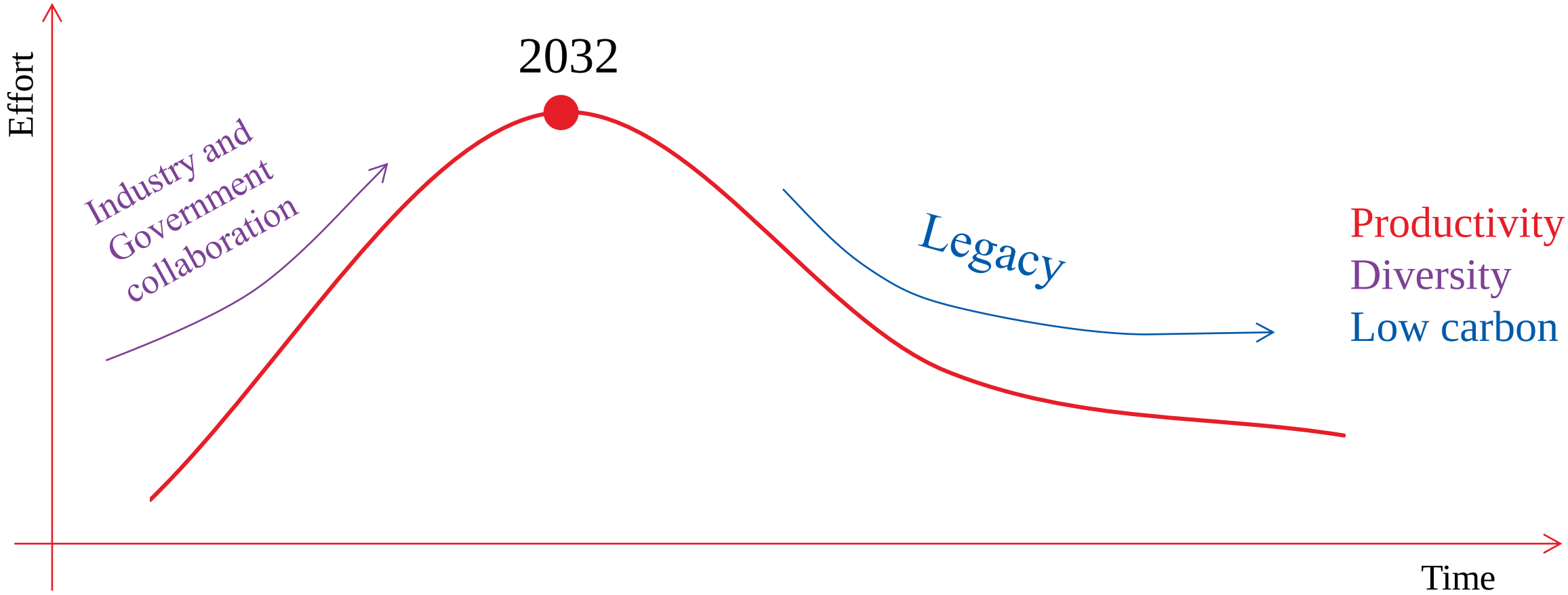
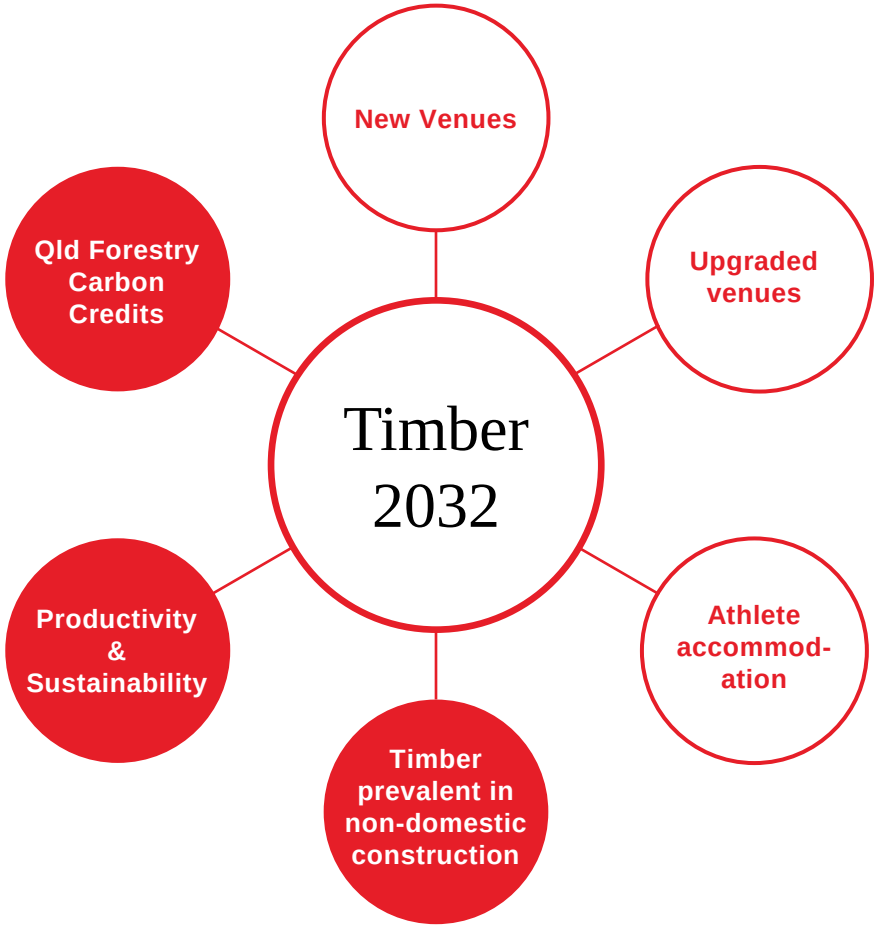
Timber 2032

Leaving a timber legacy



Timber 2032

Leaving a timber legacy



Olympic construction

Non-Olympic construction

Timber legacy plan

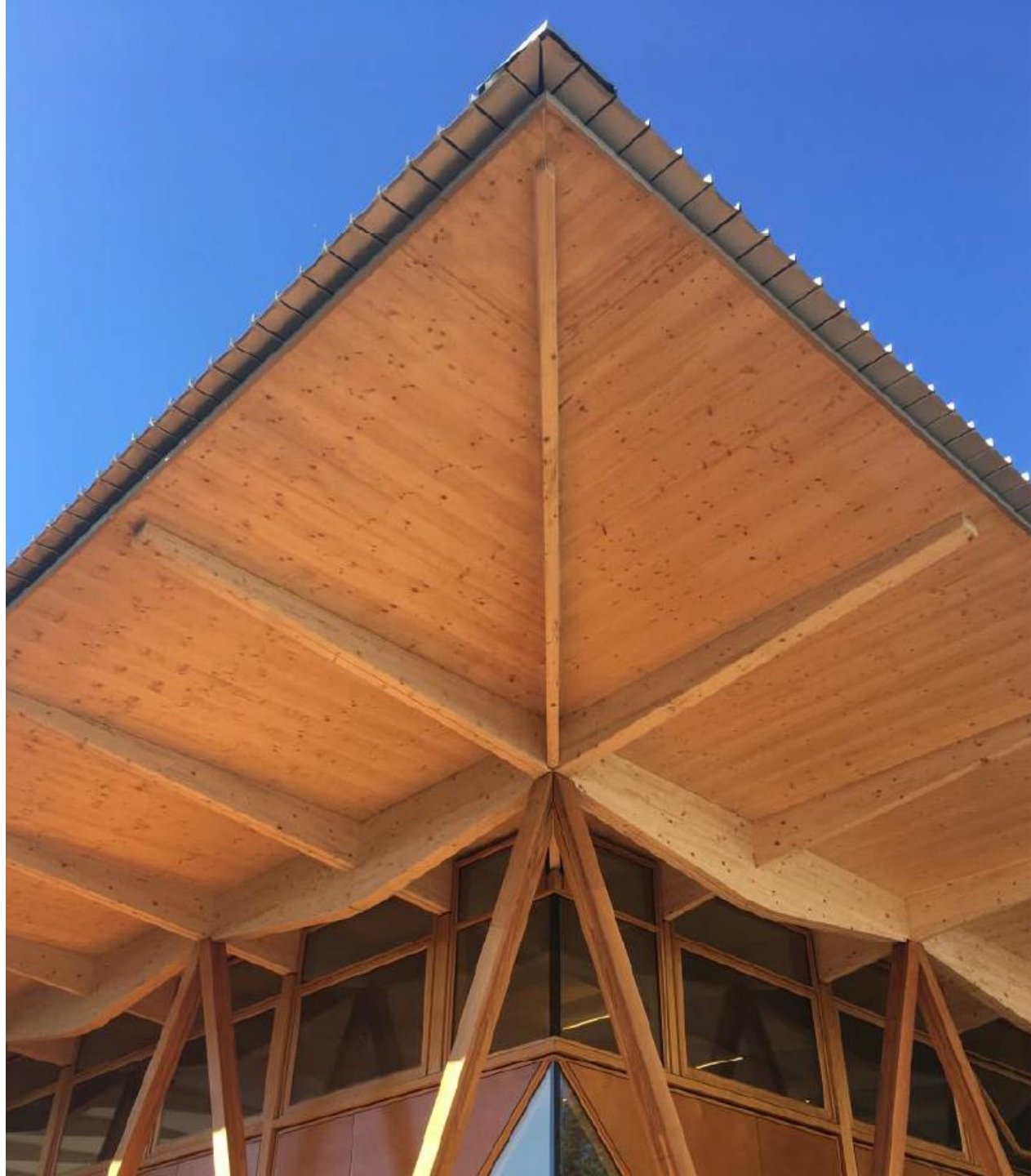
How can State Government help?

- A ‘timber-first’ policy for gov. projects (consultants are doing it anyway)
- Support Qld agro-forestry industry to look at developing an ability to offer carbon offsets
- Increase training in offsite manufacturing and mass timber construction, including CLT
- Prepare guidance on equivalence for certifiers, for overseas supplied materials
- Prepare guidance to specifiers for durability and acceptance to DTMR, QR specifications etc.

Timber legacy plan

How can State Government help?

- Work with QFES to develop guidance for certifiers, architects and certifiers for routes to compliance.
- Recommend a holistic fire engineering approach is encouraged – focuses on hazards rather than code compliance.
- Support collaboration at Advance Timber Hub, and dissemination of completed fire research, knowledge and understanding developed at UQ – a world leader in the field



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The Olympics *will change* our construction industry

What do we want our legacy to be?

Toby Hodsdon

Associate Principal | Structures Team Leader, Qld

MEng (Hons) CPEng MICE RPEQ

Arup
Level 4, 108 Wickham Street,
Fortitude Valley, QLD 4006, Australia
d +61 7 3023 6131
m +61 439 470142
arup.com