ARC NICE HUB STRATEGY

2021-2026

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SUMMARY

The ARC NiCE hub strategy aims to synthesize the hub's vision/goals/pathways against these three high-level pillars.
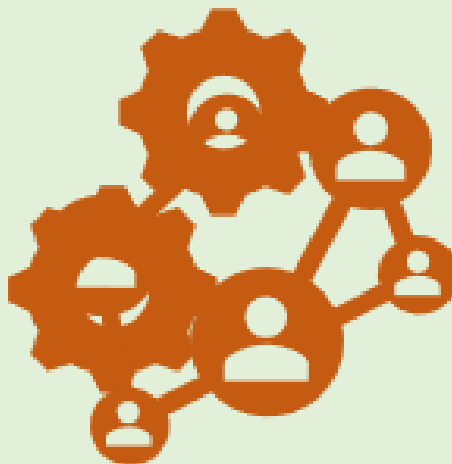
1. **VALUE CHAINS** (end-users, economics)
2. **PEOPLE & POLICIES** (public perceptions, stakeholder engagement, policies & strategies)
3. **TECHNOLOGY & INNOVATION**
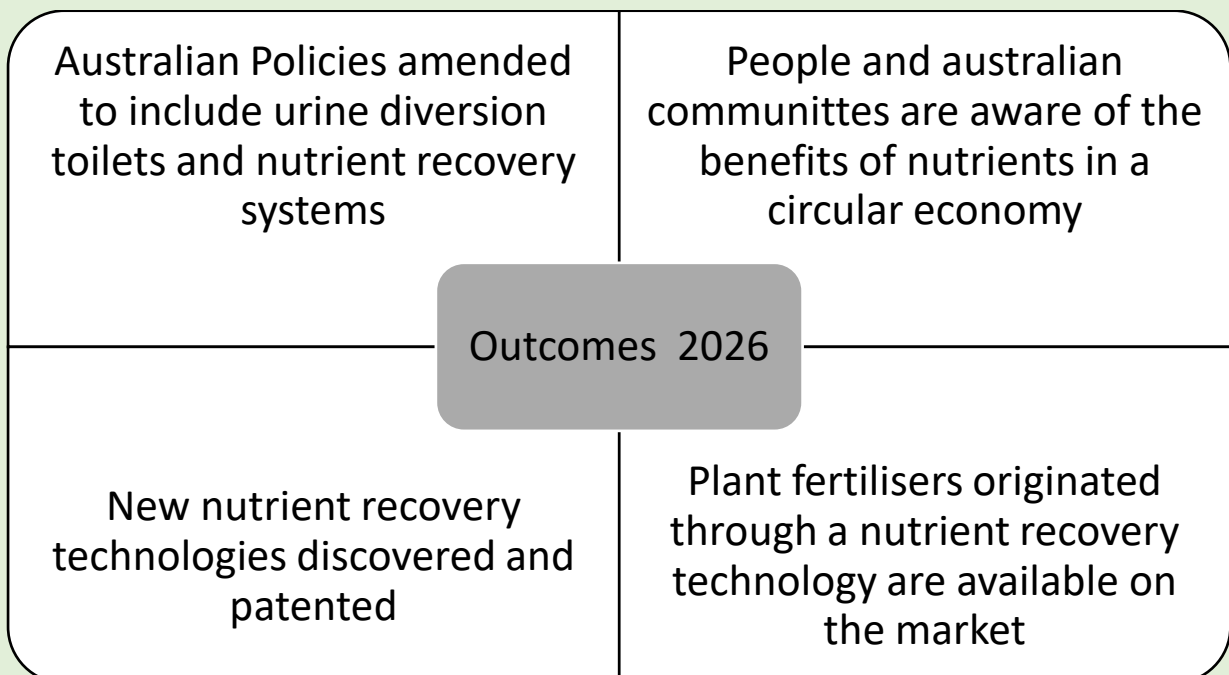
Value Chains

People and Policies

Technology and Innovation

1 The Strategy on a Page

The NiCE Hub will help to transform Australia's wastewater and resource recovery industry into an advanced manufacturing industry by addressing three main levels of change: Value Chains, People and Policies, and Technology and Innovation.

Value Chains

- Identify potential markets for recovered resources
- Identify industries that will play a crucial role in the transformation of resource recovery
- Showcase products from the circular economy of nutrients
- Optimise fertilisers generated through a circular economy of nutrients

People and Policies

- Consult communities and address their concerns
- Launch a public awareness campaign
- Build trust with people and convince them to adopt nutrient recovery habits
- Work with policy makers and regulators to change Australian policies to facilitate nutrient recovery from human waste

Technology and Innovation

- Select and enhance cost effective technologies
- Develop new engineering processes to recover nutrients from waste
- Identify problems with existing nutrient recovery technologies and work on improving them
- Design and implement environmentallly friendly technologies with zero carbon emmission

Outcomes 2026

Australian Policies amended to include urine diversion toilets and nutrient recovery systems

People and australian communittes are aware of the benefits of nutrients in a circular economy

New nutrient recovery technologies discovered and patented

Plant fertilisers originated through a nutrient recovery technology are available on the market

2 Values

<u>Core values:</u>

Our research activities, initiatives, commitment and purpose are guided and driven by the following core values:

- Innovation
    - We continuously seek and develop new and transformative technologies and sustainable processes to recover, and reuse resources from wastes.
- Collaboration
    - We actively contribute, communicate and maintain good relationship with our research partners and stakeholders in working together as a team towards achieving our mission and vision.
- Transdisciplinary
    - We engage our partners and stakeholders as co-producers of knowledge and develop integrated knowledge and practices together.
- Social commitment and practical application
    - We aim to produce cost-effective and environment-friendly technologies and processes with social license for practical application to the industry and community.
- Sustainability and circularity
    - We strive to conduct responsible actions, and decisions for the good of our society and the environment in an economically-affordable way, while reducing materials and energy use and eliminating waste generation.

3 Vision & Mission Statements

3.1 Our Vision

Working towards the integration of nutrients recovery in people perception, industry processes and future technologies supported by a series of regulations and policy changes to protect the dramatically changing and declining environment.
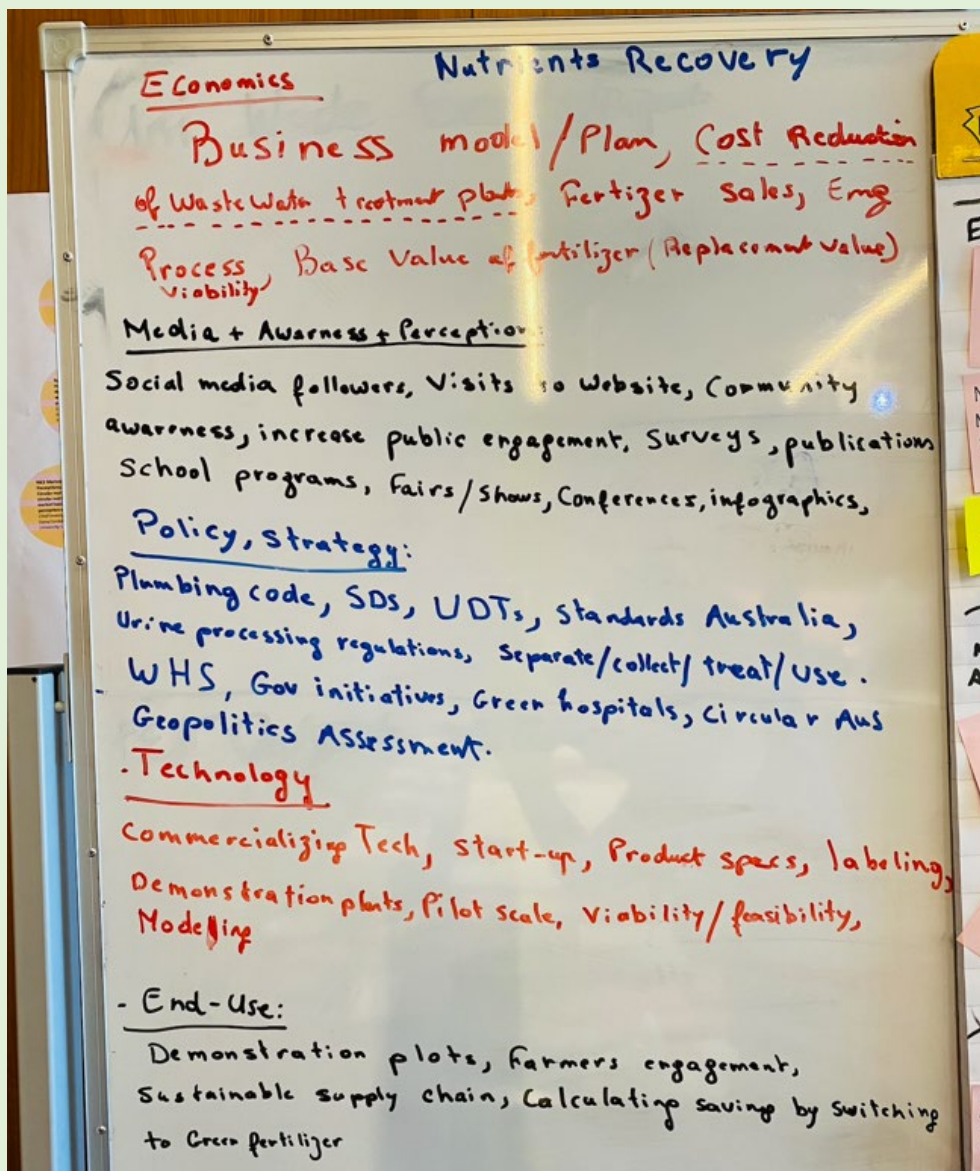
3.2 Our Mission

Undertake research, collaboration and outreach to unlock and push for nutrient recycling and try to create generational change, public awareness, resource conservation and ensure a national and global legacy.

4 SMARTT Goals

1. Develop a business model of nutrients separation and recovery from waste - from collection to reuse.
2. Engage with local, regional and international communities to reveal the importance of nutrients separation, recovery and reuse
3. Work with policy makers and regulators to change policies and acts in order to facilitate nutrients recovery from human urine
4. Design, test, operate and enhance new technologies to produce fertiliser from human urine
5. Test fertilisers and their applicability in horticulture and agriculture

5 Our Strategic priorities

5.1 Outcome: Value Chains

Strategies	Possible Deliverables
• Identify potential markets for recovered resources	• Ag sector – competitive; share of the market, displace conventional fertilisers • Putting into food production – if landscaping; restoring lands – trade-offs • Demonstrated economic viability of waste → fertiliser at scale • NiCE created new effective green fertilisers • Human urine economy prospects
• Identify industries that will play a crucial role in the transformation of resource recovery	• Fit for purpose in the short-medium term • Export our technology to Korea, Europe, US or the world (but not export our PRODUCT because we need to use our nutrients in Australia) • Sustainable supply chain for edible and non-edible crops • Multiple urban farming demonstration sites
• Showcase products from the circular economy of nutrients	• Marketing our 'label' like "circular". • Australia produces greenest fertiliser in the world • Game changers for next generation green fertilisers • Each person is now a mobile crop fertilise producer: this is circularity • Demonstrated with farming/end user • Park managers, farmers in western Sydney on track to use 100% of fertiliser from recovered sources
• Optimise fertilisers generated through a circular economy of nutrients	• Sydney and Brisbane's river parks on track for improvement, trees recovering strongly with recycled nutrients • Regeneration projects take off, thanks to NiCE • NiCE hub research adopted by end users → demonstrated waste use/raw material avoidance, savings, etc • Demonstrated in partnership with industry and community to recover nutrients from problematic waste • Develop a green fertiliser which the Ag + hort sectors are confident to use and is competitive with conventional fertilisers both in cost and performance

5.2 Outcome: People & policies

Strategies	Possible Deliverables
• Consult communities and address their concerns	• NiCE surveyed the public to obtain a social licence
• Launch a public awareness campaign	• Public perception → convinced • Urine recycling is now a culture • Our urine is not smelly • Champions of change
• Build trust with people and convince them to adopt nutrient recovery habits	• Our urine could help save this planet • No more fertiliser shortage in the world following new NiCE hub revelations • Featured in Costa's Home and Gardens, Landline social media • NiCE a household name • Kids' books and games for promoting nutrients recovery • 2032 Brisbane Olympics going for UGOLD, …. partners with NiCE for green Olympics
• Work with policy makers and regulators to change Australian policies to facilitate nutrient recovery from human waste	• Certification • Push for policy and industry environments to change in the long term • Amendment in the building codes to include urine diversion toilets • NiCE led to changes in policies and regulations • NiCE led the design change and the way of construction for modern building in the world • Identify new roadblocks to scaling up the technology • National circular economy bench-marking • Plan for eliminating nutrient flows into urban rivers by 2035 • First comprehensive strategy for how Australian cities can transform waste into a circular nutrient value chain

5.3 Outcome: Technology & Innovation

Strategies	Possible Deliverables
• Select and enhance cost effective technologies	• Successful Startups • Clear ROI
• Develop new engineering processes to recover nutrients from waste	• New Science/innovative approach/Adoption of research
• Identify problems with existing nutrient recovery technologies and work on improving them	• New waste treatments are safe to use in parks, gardens, fruit and veg production • Scientific breakthrough in low cost nutrient process to produce fertiliser, paper, IP, etc
• Design and implement environmentally friendly technologies with zero carbon emission	• Validated cutting edge technologies for nutrient recovery

6 Strategic pathways

6.1 Value Chain

Economics

- Ensure active industry engagement through industry focused workshops, panel discussions in strategic forums facilitated by well-known experts or media personalities, CECE (Circular Economy in Climate and Environment) conference, NiCE summits, etc.
- Through hub engagements, work on removing barriers with industries by allowing major access to research data in the hub.
- Engage with researchers, students and industry through the CECE conference.

End-users

- Pilot demonstration of the technology and fertiliser use performance through farmer's engagement (critical)
- Ensure sustainable supply chain of the urine-based fertiliser
- Align with the advanced manufacturing of industry growth centres (national priorities)
- Mobile technology demo with dashboard and fun features
- Industry focussed workshops and educations for farmers

6.2 People & Policies

Media and Awareness program

- NiCE Hub newsletter where any CIs can send to publish the news about their works under the hub
- Weekly features in social media such as LinkedIn, Twitter, and regular update in the Hub website
- Media policy is already established and implemented

- Promoting urine-based fertiliser for non-food plants and slowly with awareness become more acceptable to public for food plants with improved safety through reduced risk.
- Explore to leverage the works of the new CRC-SAFE
- Public engagement/publicity/education/awareness: Must have baseline survey to know the impact of the hub on public acceptance after 4 years.
- Develop a strategic public promotion through media including articles such as in ABC, public talks, timely and strategic release of news,
- Use the services of professional artists and cartoonist for animated features to convey hub message. Eg. CSIRO uses services of https://www.redboat.com.au/

Policy strategy

- One of the hub outcomes for policy contributions/changes can be such as building code or plumbing code at local, state and national levels where required.
- Strategically use relevant agencies to bring about policy changes. For example, Sustainable Building Australia can use building sustainable ratings to include urine diversion and nutrient recovery as part of sustainable development
- Explore how Circular Australia can facilitate and help NiCE hub in the policy strategies
- Hub outcomes must connect to the SDGs all the times.

6.3 Technology & Innovation

- Commercialising technology if ready or improved TRL for new technologies such as Ugold and Urval including full-scale pilot demonstration.
- Achieve Startups companies to market these new technologies

7 Monitoring and Evaluating the strategy

Delivering on the strategy depends on the effective collaboration of chief investigators with our industry partners involved in the NiCE research hub. The majority of our research projects are simultaneously funded by the Australian Research council and industry partners, with few funded solely by the Australian Research Council or an Industry partner. There are many factors that contribute to the achievement of key performance indicators (KPIs). The NiCE hub will work with individual projects' leaders to define their KPIs as part of their project development and hub deliverables.

7.1 Outcome: Value Chains

Strategies	Possible KPIs
• Identify potential markets for recovered resources	• Number of Rural/remote end uses • Feasibility document with Industry partners – at what scale? Specific context • Fertiliser sales, and base value of fertiliser • Conduct economics of different scale • Fertiliser replacement value – calculation
• Identify industries that will play a crucial role in the transformation of resource recovery	• Number of Business model/ Plan,

| Strategies	Possible KPIs
	• Concrete figures about the cost reduction of wastewater treatment plants • Engineering process viability • Driving force pressure state exposure (framework for indicators) – Dept of Environment has a mission to develop better indicators • Number of Startups • Value of cost-avoidance
• Showcase products from the circular economy of nutrients	• Number of sustainable supply chains • AgForce, FoodAgility • Number of sustainable supply chains – demonstrate relative to fertiliser price volatility
• Optimise fertilisers generated through a circular economy of nutrients	• Number of demonstration plots • Number of farmers engagement • Calculating saving by switching to green fertiliser • Cost – parity has to be achieved

7.2 Outcome: People & Policies

Strategies	Possible KPIs
• Consult communities and address their concerns	• Number of public engagements such as surveys and publications • Number of school programs and agricultural shows for education • SDGs on website – how the hub links and measures against SDGs (good metrics) – stakeholders have to do this anyway (could be a student project?)
• Launch a public awareness campaign	• Number of community awareness campaigns • Number of community meetings and public engagement forums • Number of participations in fairs, shows and conferences • Number of Infographics
• Build trust with people and convince them to adopt nutrient recovery habits	• Social media followers and visits to website • Number of campaigns with emphasis on Separate → Collect → Treat → Reuse • Number of green hospitals/airports • Geopolitics assessment?
• Work with policy makers and regulators to change Australian policies to facilitate nutrient recovery from human waste	• Number of plumbing code changes • Number of Safety Data Sheets • Number of Urine diversion toilets exemption or use approvals • Number of new Standards Australia standards relevant to nutrients recovery

	• Number of amended urine processing regulations • Number of work health and safety regulations • Number of Government initiatives on circularity of nutrients • Number of policy advocacy groups - collective statements • Number of Circular Australia briefings – lobbying

7.3 Outcome: Technology & Innovation

Strategies	Possible KPIs
• Select and enhance cost effective technologies	• Number of commercialised technologies • Number of Startups • Number of developed models
• Develop new engineering processes to recover nutrients from waste	• Number of pilot scale • Level of technological development (increases in the TRL) • Nutrient recovery should be technically feasible, economically viable and environmentally sustainable and product should be mapped to relevant industry partners as the stakeholders' groups are inherently linked • Number of demonstration plants
• Identify problems with existing nutrient recovery technologies and work on improving them	• Feasibility study at different scales, and viability for constancy in quality at different application should be actively conducted for demonstration • Number of product specs • Number of new breakthroughs
• Design and implement environmentally friendly technologies with zero carbon emission	• Hub should aim at technology demonstration through pilot-scale operation and field application which is critical for farmer's confidence with the technology including the risk. Technology transfer can be too ambitious at this stage. • Hub should also explore for a small-scale nutrient processing technology in addition to the larger scale system to be able to use individual at homes.

8 Barriers & Opportunities
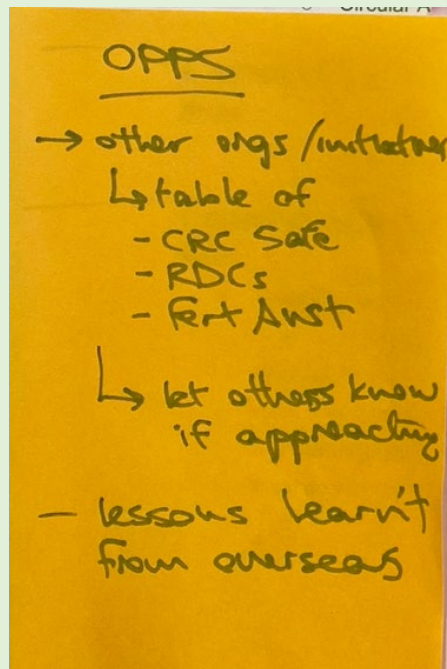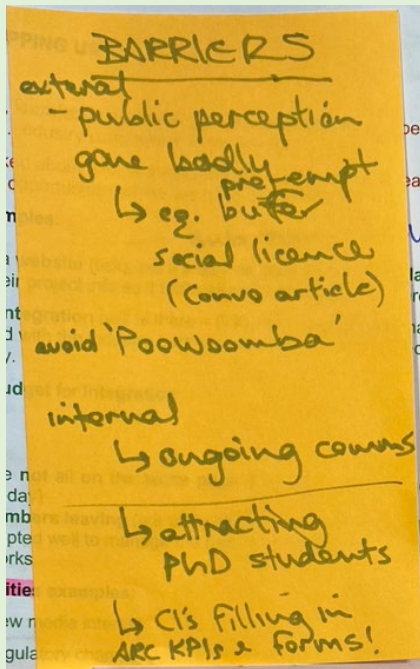
8.1 Barriers & Risks

- Internal barriers (within the Hub):
    - Don't have the volume! (i.e. KL of urine or 100s of tonnes of other organic waste nutrient sources).
    - Haven't involved construction industry – need new building codes.
    - Ongoing comms is key – e.g. between CIs.
    - Challenging for CIs to complete ARC admin in timely manner (e.g. ARC KPIs!).
    - Attracting PhDs students has been hard for some.

- External risks:
    - Public perception gone badly is a huge risk.
    - Need social licence for NiCE. We need to pre-empt and plan for this. e.g. through the proposed strategic conversation article (see Actions below).
    - Hub must avoid the risk of the public perception goes completely wrong and gets negative publicity such as due to safety concerns of the recovered nutrient rather help build social license.

8.2 Opportunities & Enablers

- Who can we align with: CRC Safe – ag sector.
- Use conferences and other events to flag in NiCE works.
- Lessons learnt from overseas – e.g. Sweden, The Netherlands etc.

9 Concrete actions

- Create 3-4 <u>WORKING GROUPS</u> for key cross-cutting thematic areas:
    - <u>Media and comms</u> Working Group (Newsletter, twitter, feature each project, website, Conversation article, project Costa).
    - <u>Economics</u> Working Group
    - Operation '<u>Change the Plumbing Codes</u>'! Working Group - a key barrier that needs to be overcome.

- Engaging our hub <u>industry partners</u> – we need to understand their expectations from the Hub? Will they be working on financial viability of technologies by default? We could feature them at the next Hub Summit (e.g. both a high-level Panel with journalist moderator, plus, table discussions – e.g. World Café where there is one industry partner on each table, with CIs etc asking questions/discussing).

- <u>Internal integration</u> – TEAMS 'marketplace' how to engage industry partners.

- Engaging with other <u>external organisations</u>:
    - E.g. need to engage the RDCs (Hort Innovation, GRDC, MLA) re extension and awareness.
    - To manage this, we need to create shared and live table (Google Docs?) with other organisations we have or might engage, including why we think they are relevant, who has/is approaching them.
    - How do we better engage <u>farmers</u>? They are the ultimate end-users.

- Create an <u>internal hub protocol</u> for engaging with industry partners and other organisations:
    - Industry partner – let the CI of that project know you'd like to contact that industry partner (out of courtesy and also if any coordination is required).
    - let others in the hub know if you plan on approaching an external org for your project, in case there is a need to coordinate with other projects).

- <u>Re commercialisation</u>:
    - Commercialisation needs to be on an individual project level.
    - Measure and monitor TRL for relevant projects – Tech Readiness Level.
    - UrVal still needs an industry partner (so currently lower on the readiness scale).

- <u>Communication and public awareness</u>:
    - Important to create a <u>clear narrative</u> about what NiCE is trying to achieve – e.g. food security and local manufacture are important sustainability goals (hence we prioritise reuse of nutrients for food production over other land-based applications like landscaping). However, this also needs to be fit for purpose.
    - Could use <u>DPSR Framework</u> for frame our contributions to SDGs plus other key sustainability indicators.

- Do we need a <u>pop-up demo site</u> that can be taken around, e.g. Easter Show, Hawkesbury Show, which brings in farmers from Western Sydney; SEW has a demo site.
- We could use real-time 'tickers' for the trials?
- <u>Media</u> ready and waiting for window of opportunity; first Dog on the Moon – Australians like satire.
- Use <u>VisComm students</u>; RedBod(?) animations?? (top notch).
- Piece in <u>The Conversation</u> on public perception to benchmark and advertise our work.

Appendix

Highlighting the importance of capturing, recovering and reusing nutrients from waste and their application to horticulture and agriculture