Container Risk Management: *A Modelling Framework*

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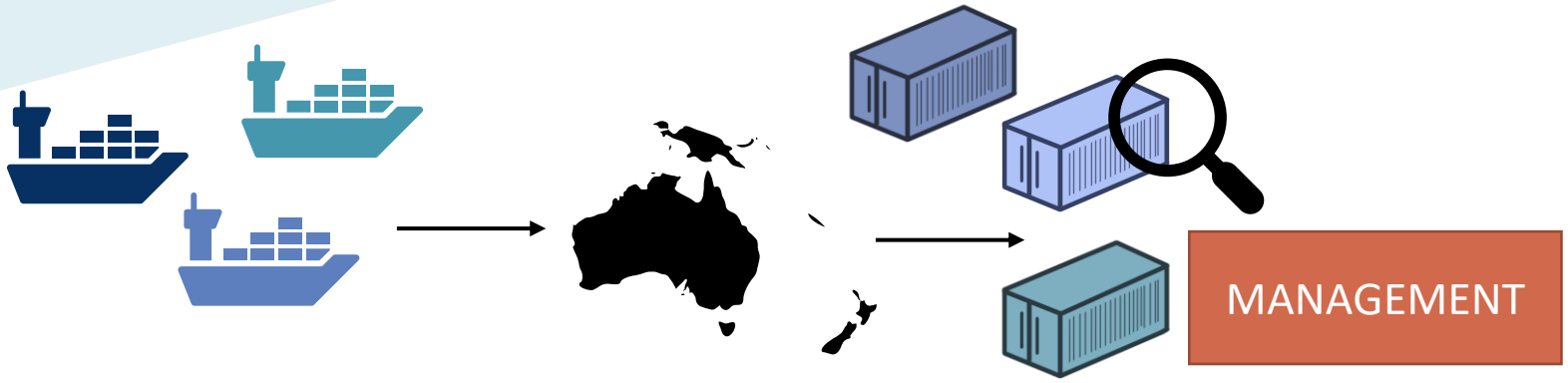
Acknowledgement

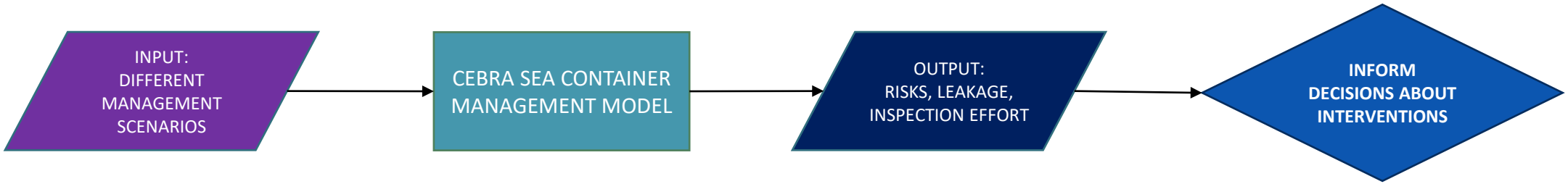
I acknowledge the traditional owners of the land on which we live and work. I pay my pay respects to their Elders both past and present and extend that respect to other Indigenous Australians who are present here today.

Introduction



There are currently systems in place to manage Australia's biosecurity risk from sea containers and containerized cargo.

This project is about developing a model to simulate alternative and future management frameworks to improve efficiency and transparency of biosecurity risk management of sea containers and their cargo.



Biosecurity context

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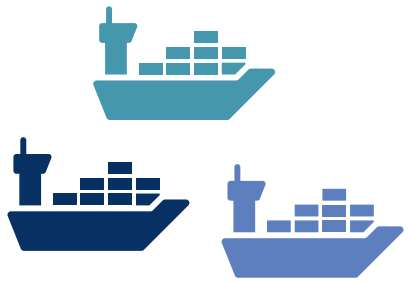
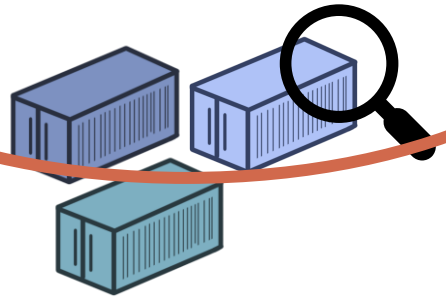
Value Model

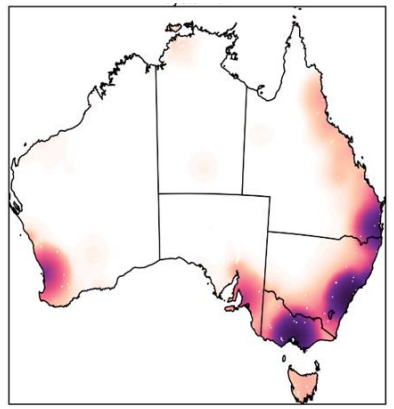


Approach rate

Border inspection and treatments



Leakage



How can we use modelling to help design inspection policies that are efficient and effective?

Modelling aims

Understand the current risks associated with containers and contained cargo.

- What is the probability that a container is contaminated?
- How does the probability depend on its attributes?

https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/giant-african-snail

Simulate potential inspection policies

- Develop a modelling framework where decisions are made depending on container attributes
- Define a variety of a inspection types
- Allow for treatment (washing) of containers
- Evaluate policy for the amount of detected contamination and inspection effort required

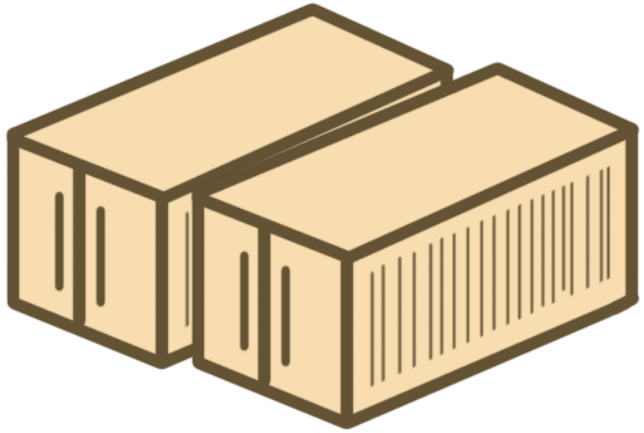
Hypothetical example – container contamination

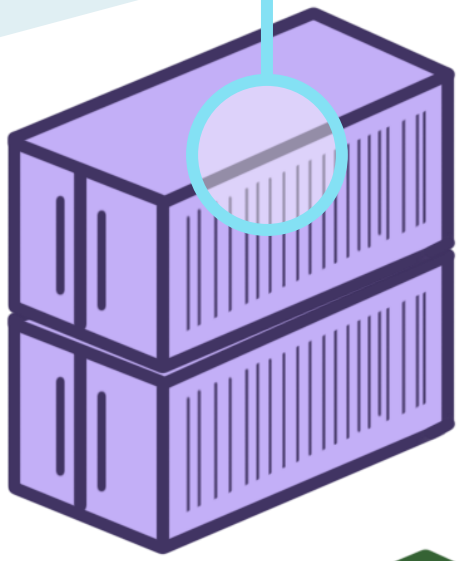
High risk origin	*Rural destination*	*Empty container*	*Offshore treatment*	*Probability of arrival*	*Probability of contamination*
FALSE	FALSE	FALSE	FALSE	15%	3.50%

Simulated Containers

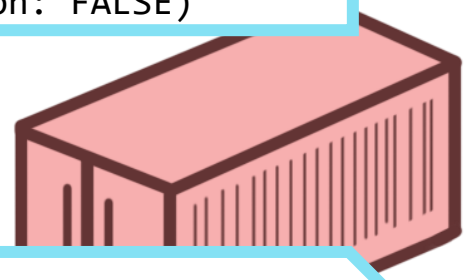
Containers have different properties

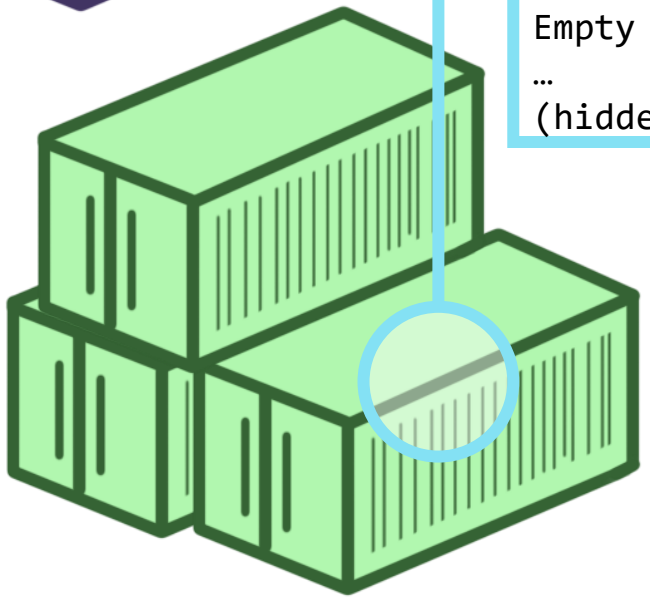
We generate (create fake) containers and store their details in a spreadsheet (not shown here)



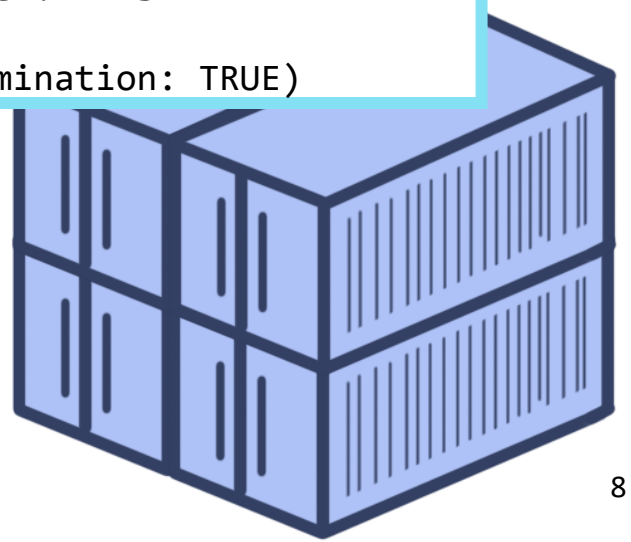


Container #111
High risk origin: TRUE
Offshore treatment: NO
Rural destination: FALSE
Empty container: FALSE
…
(hidden contamination: FALSE)





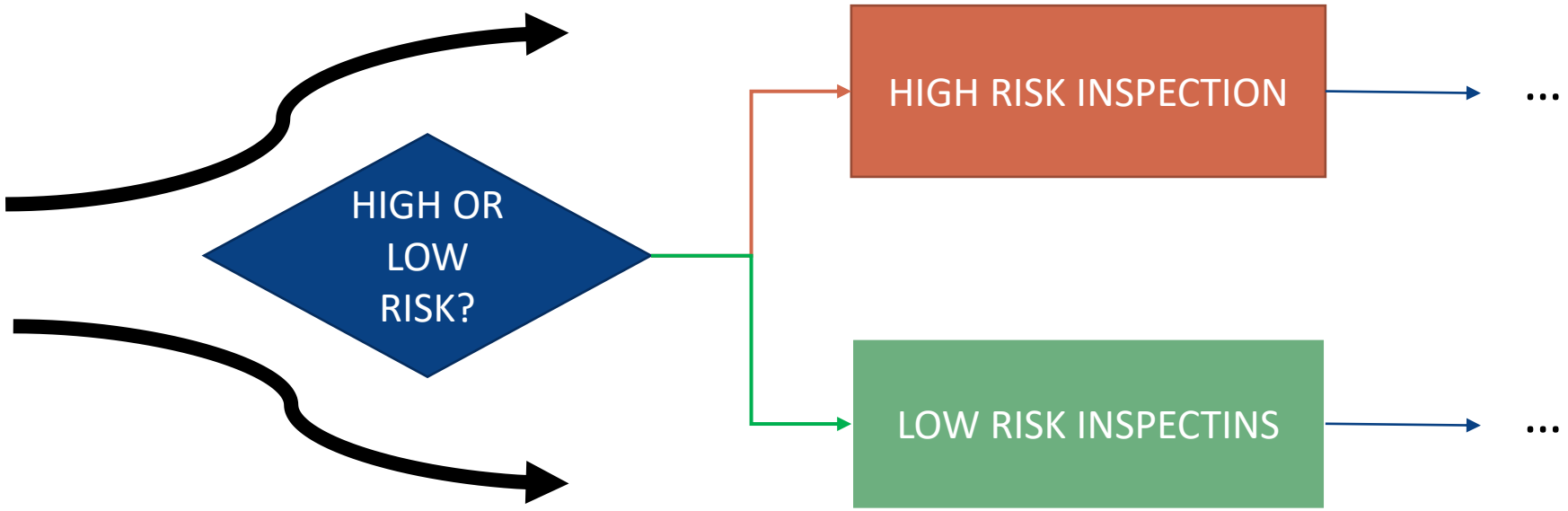
Container #452
High risk origin: FALSE
Offshore treatment: TRUE
Rural destination: FALSE
Empty container: FALSE
…
(hidden contamination: TRUE)



Overview of model / simulation framework

1. Create “digital” containers

2. Create the “digital” sea container pathway based on policy



3. Send the digital containers down the digital pathway

Pathways

The framework contains different elements

INPUT: CONTAINERS

DECISION NODE

This node splits containers (e.g. by risk)

COMPLIANCE VERIFICATION INSPECTION NODE

CSP-1 INPSECTION NODE

[YOUR CUSTOM SCHEME HERE] INPSECTION NODE

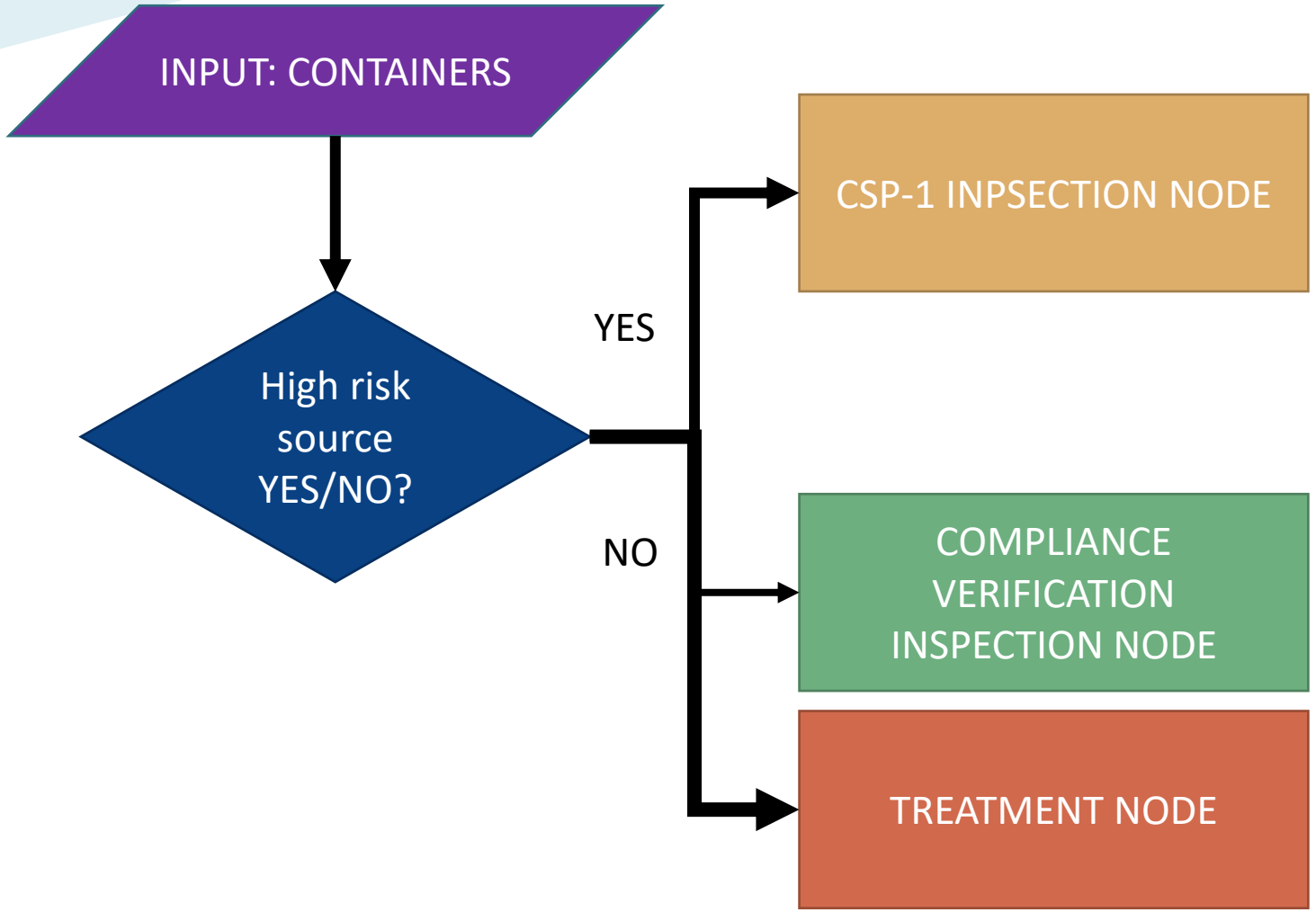
These nodes sample and inspect containers

TREATMENT NODE

This node treats containers without known inspection outcome

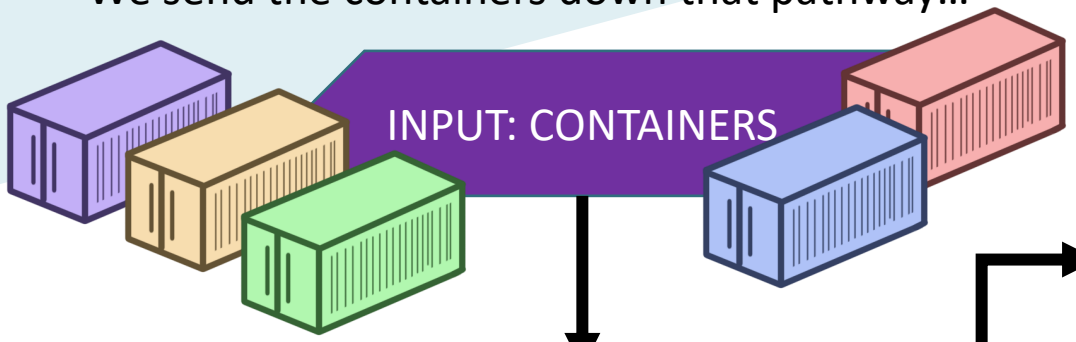
Pathways

Rearrange and link the nodes to create the pathway



Simulation

We send the containers down that pathway…



High risk source YES/NO?

YES

NO

CSP-1 INPSECTION NODE

COMPLIANCE VERIFICATION INSPECTION NODE

TREATMENT NODE

…and record what happens to them

Container #1241
High risk origin
CSP-1 inspection
No contamination found
Released

Container #731
Not high risk origin
Treatment
Released

What are inspection methods?

Compliance verification

- Randomly sample a set number of containers
- Low rate of sampling

Continuous sampling protocol (CSP-1)

- Sample a fraction of containers
- Instances of non-compliance lead to more inspections

Verification inspection

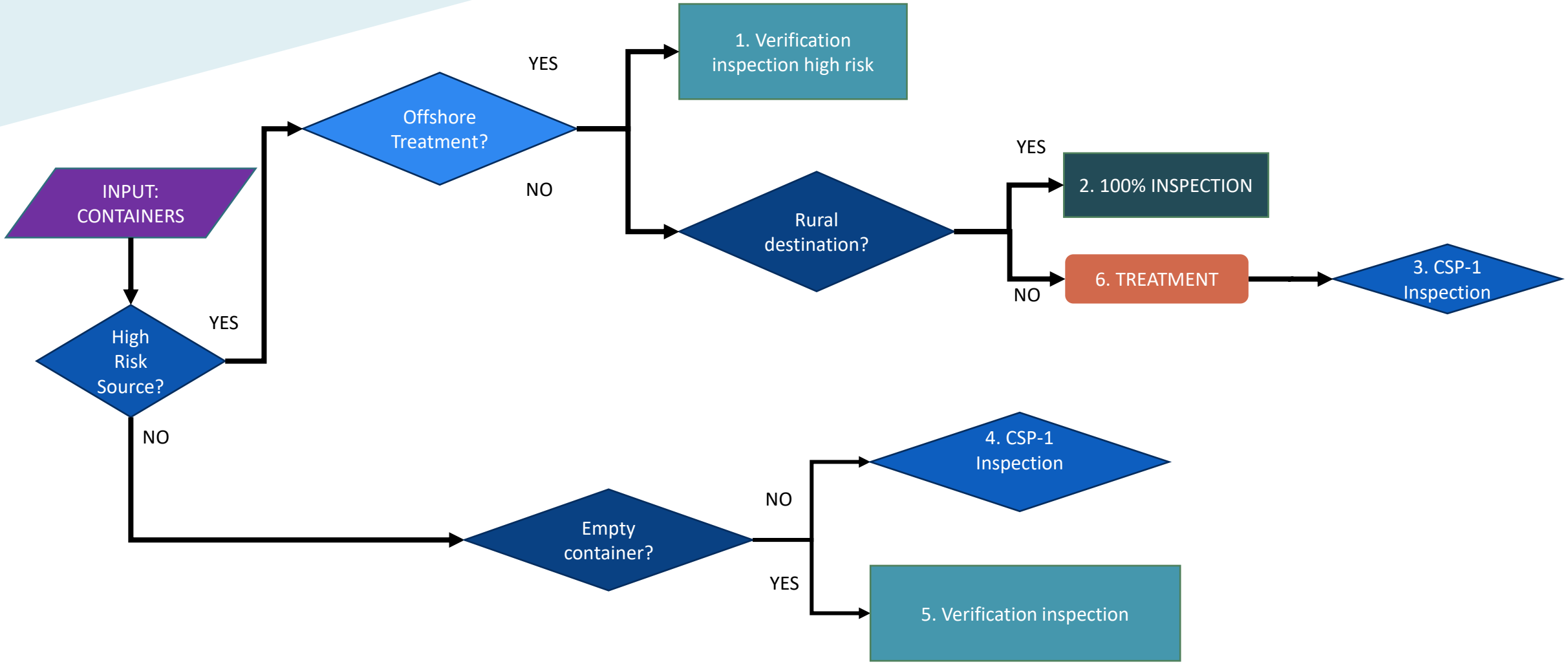
Watch this space

CSP-1 Inspection

CBIS/CSP sensitivity: incorporating pre-border information analysis

Final Report for CEBRA Project 170608

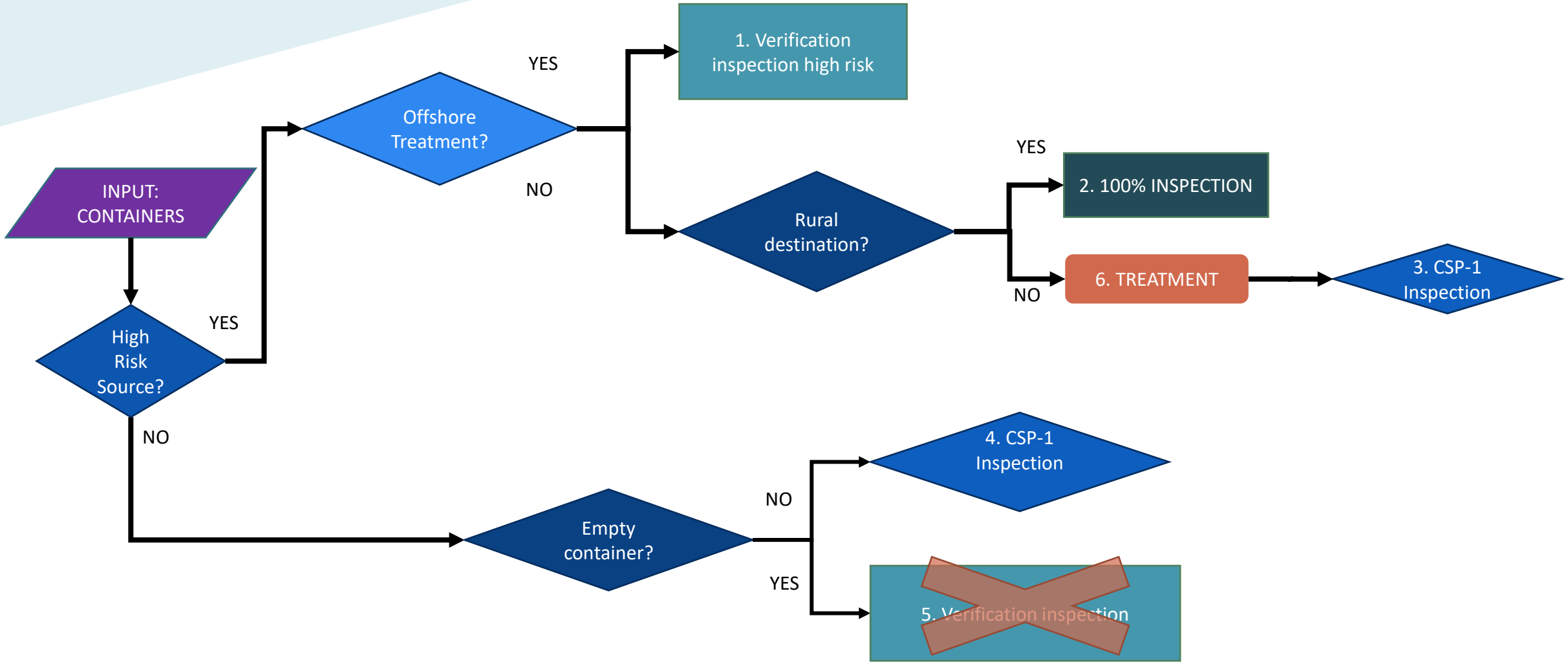
Example pathway



Example outputs

	Containers	Inspections	Contamination found	Leakage	Treated containers
1. Verification high risk	2210	306	18	118	
2. High risk inspect	2038	2038	536	67	
3. CSP-1 high risk	1233	441	35	65	
4. CSP-1 low risk	2983	1052	81	179	
5. Verification low risk	1536	314	39	168	
6. Treatment	1233				92

Example pathway



Example outputs

	Containers	Inspections	Contamination found	Leakage	Treated containers
1. Verification high risk	2210	329	15	121	
2. High risk inspect	2038	2038	540	63	
3. CSP-1 high risk	1233	437	26	62	
4. CSP-1 low risk	4519	1852	197	270	
5. Verification low risk	0	0	0	0	
6. Treatment	1233				104

Inspection summary

Scenario	Inspections	Undetected contamination (leakage)
Baseline	4270	566
No compliance verification	4656	516

Conclusions

- We can explore the potential impacts of altering inspection policy
- We can quantify the value of adding new decision nodes, or inspections
- We can estimate the leakage though the border, if the approach rate is known

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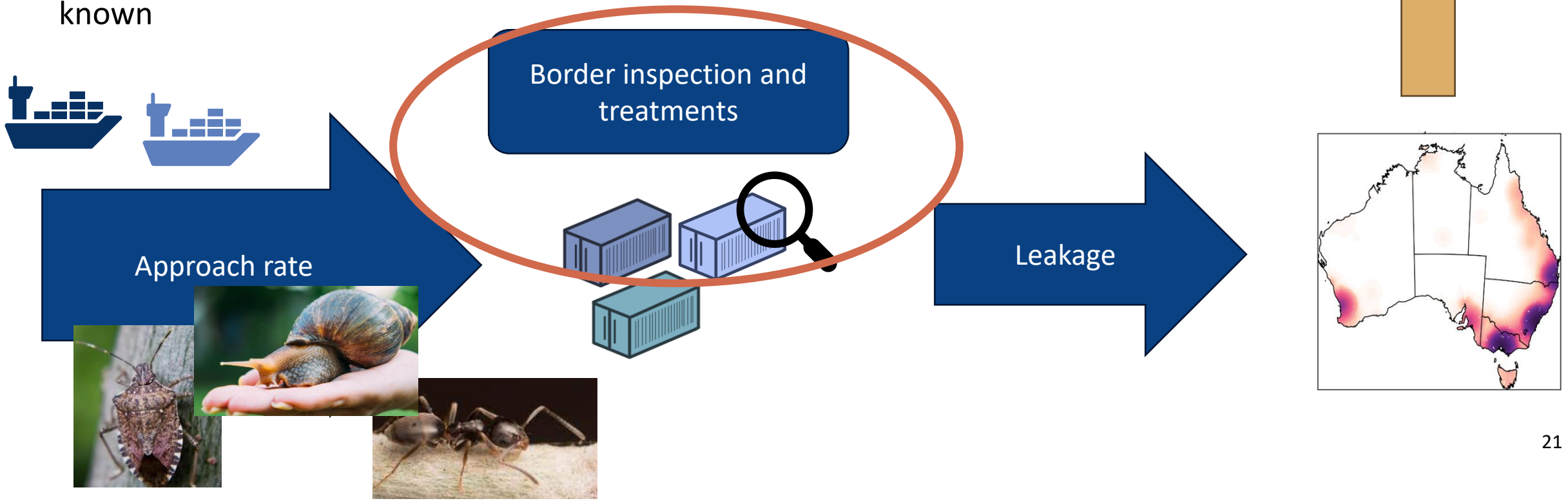
Value Model



Questions?

Thanks to:

University of Melbourne/CEBRA:

Thao (TK) P. Le, Thomas K. Waring, Andrew P. Robinson, David Rolls, Edith Arndt, John Baumgartner, Aaron Dodd, Anca Hanea, and Barbara La Scala.

Department of Agriculture, Fisheries and Forestry:

Rama Karri, Raj Iyer, Peter Manueli, Sarah Rake, BAC team, Jose Arias Nic Bottle, Richard Gao, Gregory Hankins, Tim Killesteyn, Jana Mayo, George Peyiotou, Cindy Pretty, Rachel Slatyer, Bethany Stone, Tamara Thorn, Jon Webber, and Mark Williams.

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