Food security, climate change and the Indus Civilisation, 3000-1500 BC

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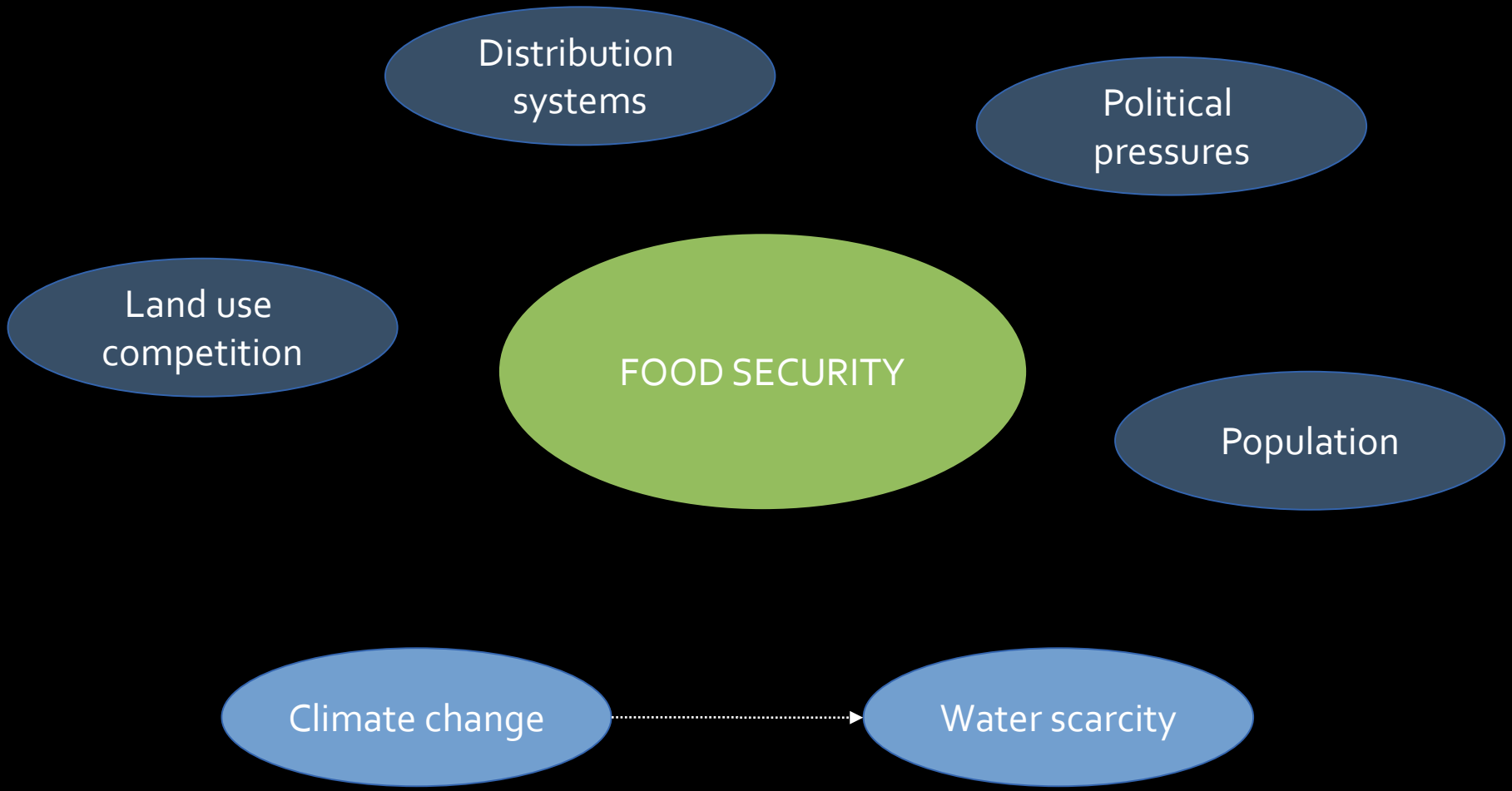
I. HOW CAN ARCHAEOLOGY BE RELEVANT TO GLOBAL FOOD SECURITY?

Pressures on food security today



Three big questions

How did these pressures affect food security in the past?

How did societies respond?

Can we learn anything from their successes and failures?

Some possibilities

PAST | PRESENT

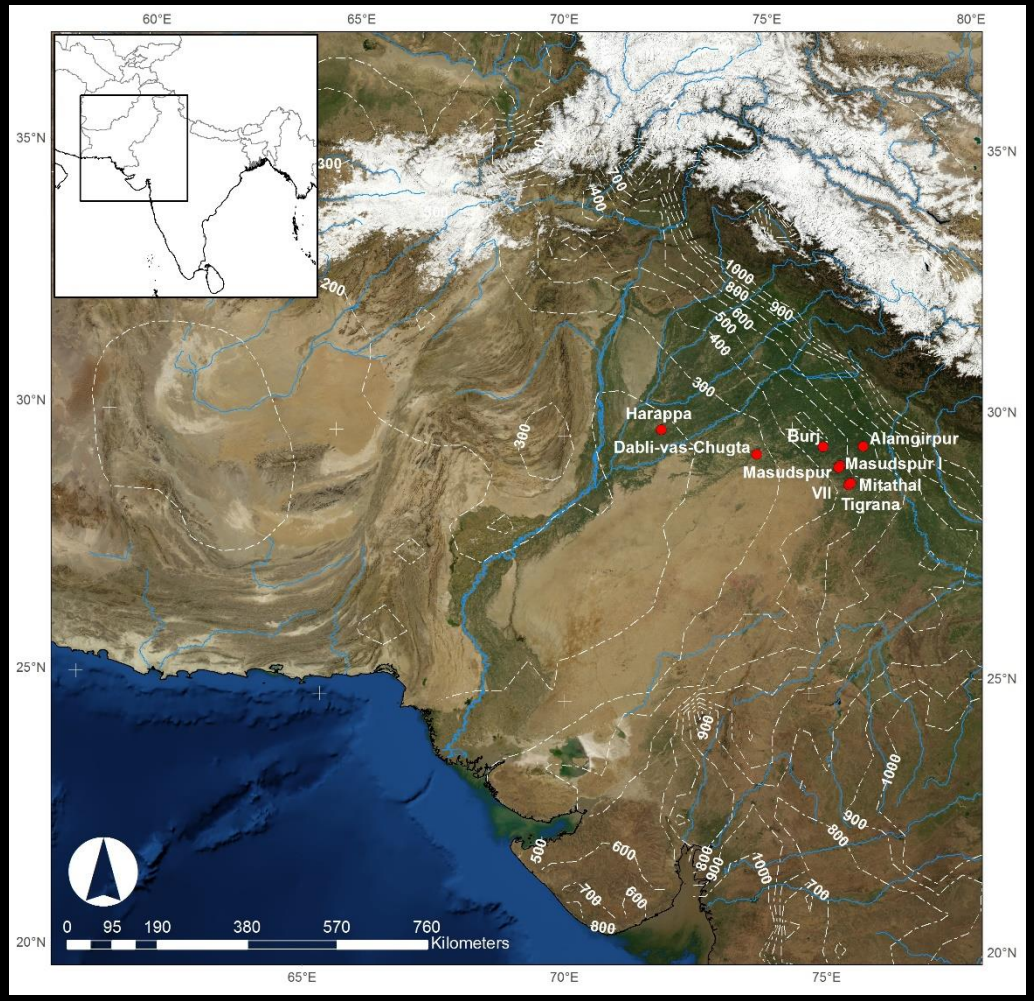
How did various pressures food security in the past? → *RESILIENCE*

How did societies respond? → *ADAPTATION*

- Capacity
- Strategies
- Success

II. FOOD SECURITY, CLIMATE CHANGE AND WATER SCARCITY IN THE INDUS

Why look at these issues in the Indus?



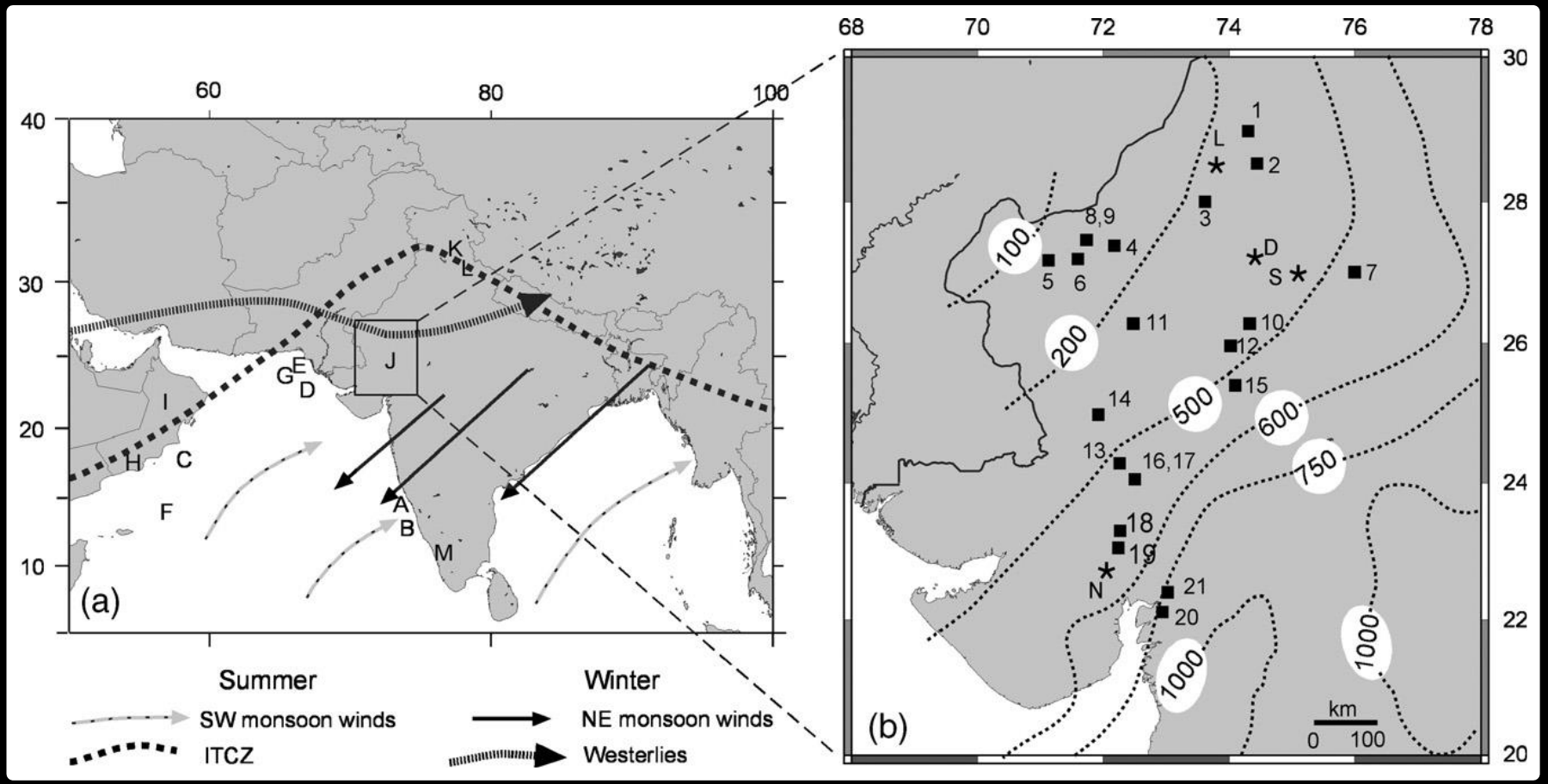
The urban Indus (Harappan) Civilisation:

Developed: 3300-2600 BC

Peaked: 2600-2000 BC

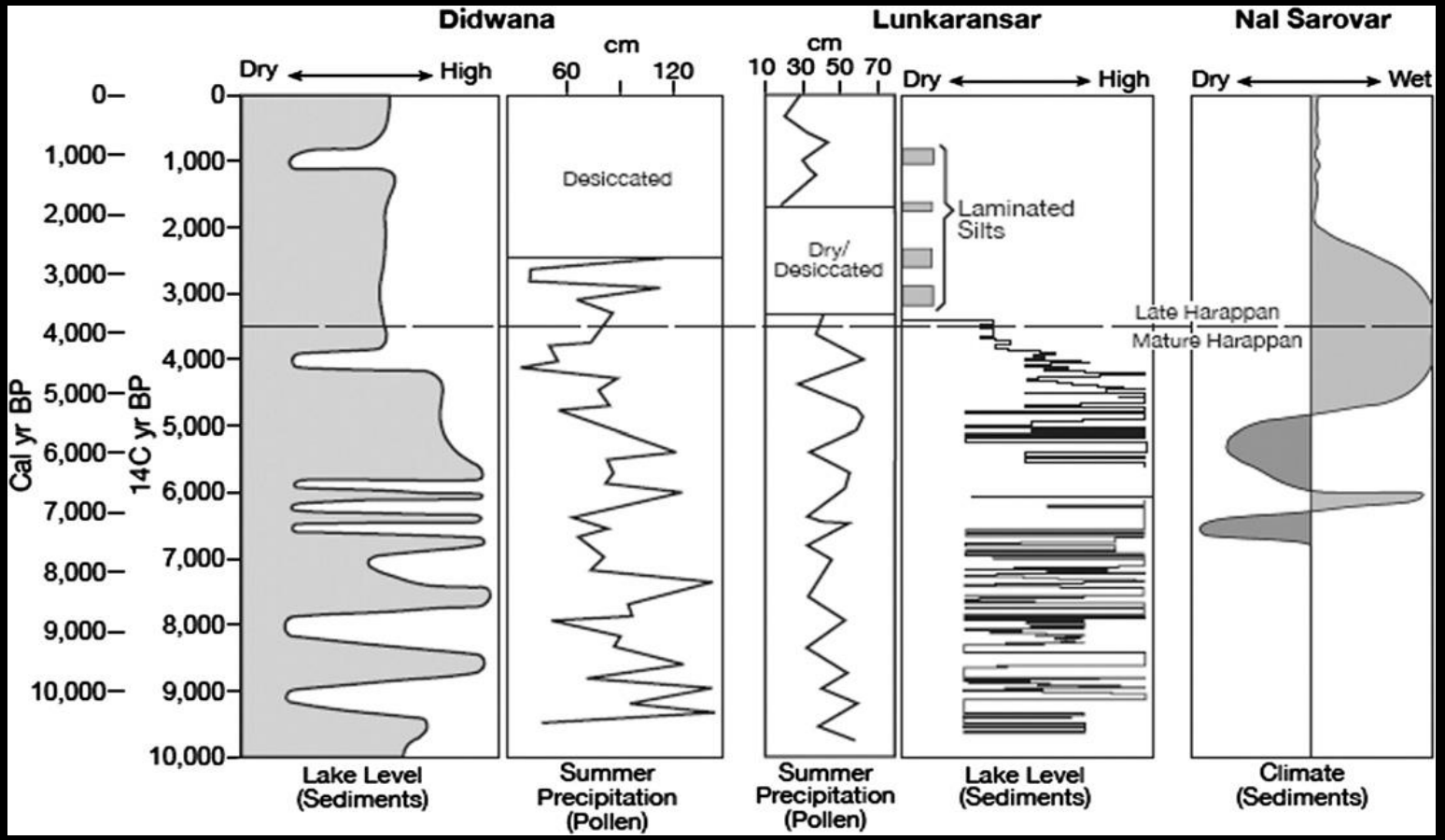
Declined: 2000-1500 BC

Climatic vulnerability



Prasad and Enzel 2006

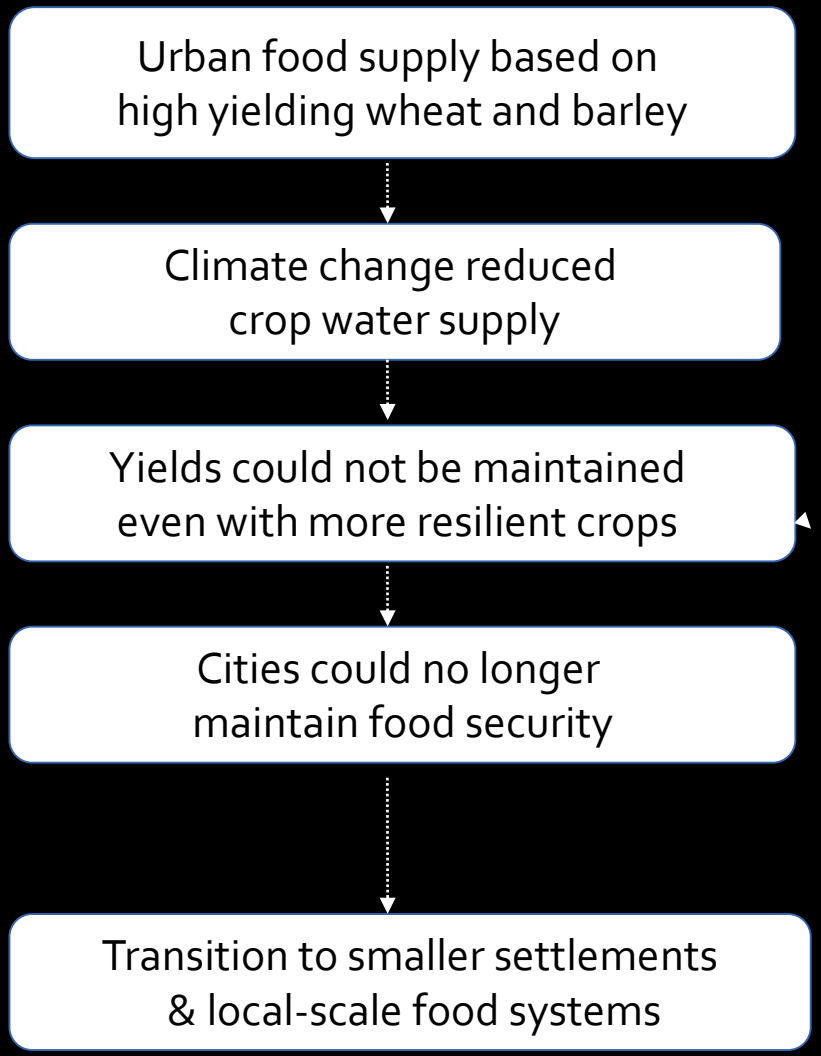
Climate change and the Indus decline



De-urbanisation

Macdonald et al. 2011

Food security as a mechanism

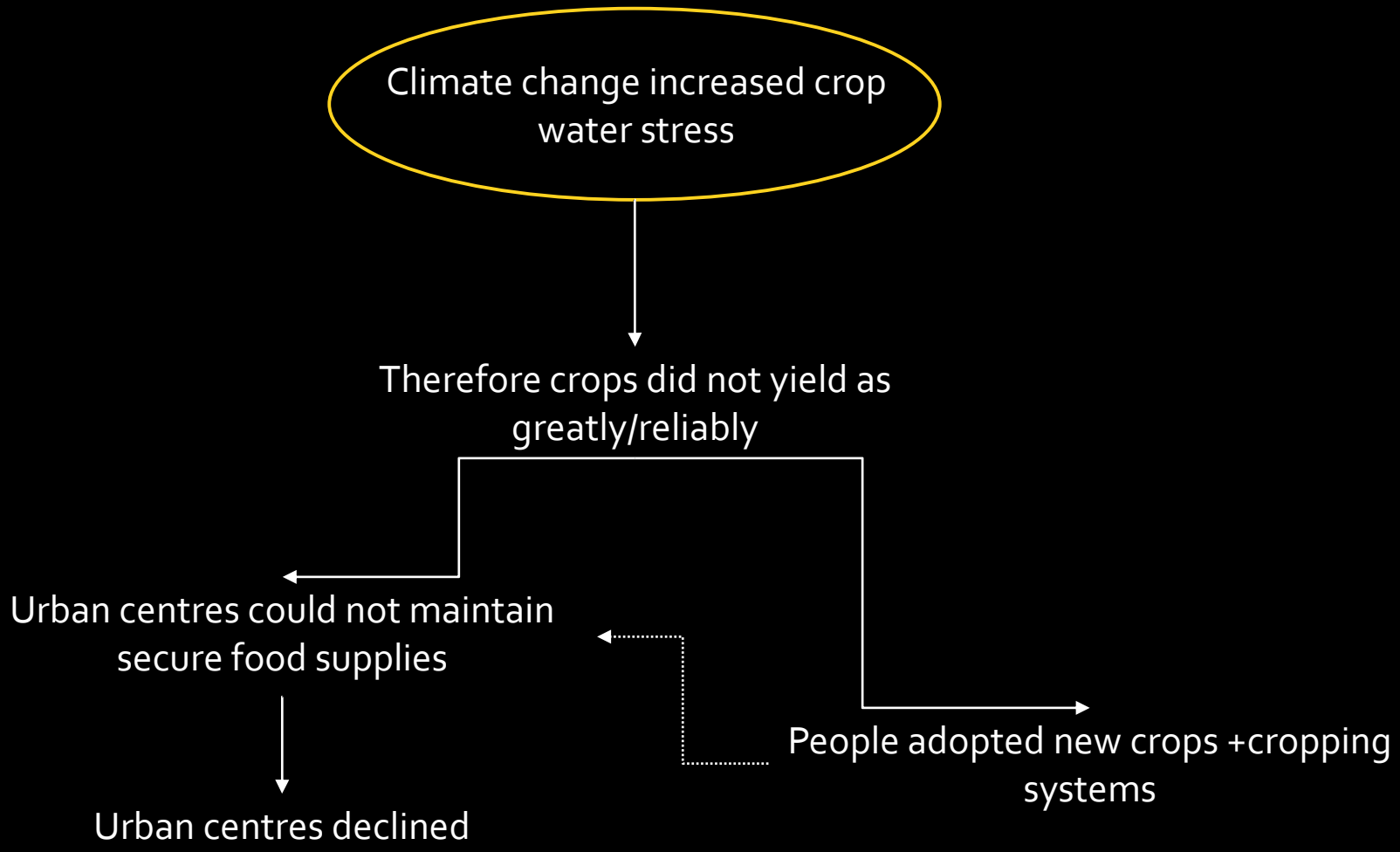


Less resilient, less diverse food systems

More resilient, more diverse food systems

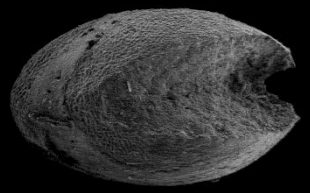
III. HOW DO WE INVESTIGATE THESE ISSUES IN THE PAST?

Crop water stress as the key



Methods = isotopic analyses of climate and crop water stress

1) Carbon isotope analysis of archaeological crop remains



$\Delta^{13}C$

Crop water stress

2) Oxygen isotope analysis of archaeological faunal remains

$\delta^{18}O$

Local climate
(monsoon rain)

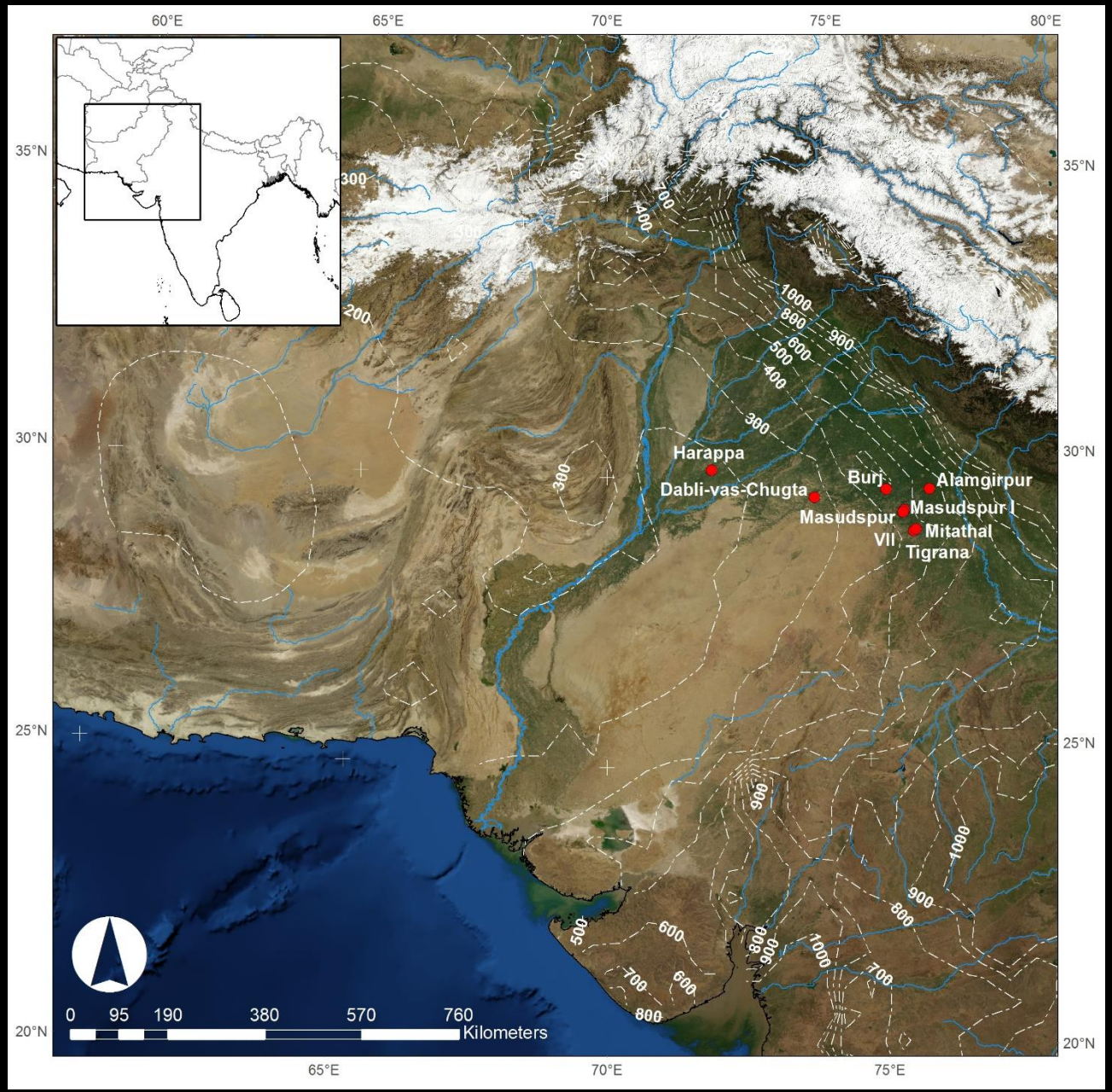
Overall research design

On a site-specific basis I will use isotopic analyses to test:

Faunal $\delta^{18}O$ → (How) did the climate change?

Crop $\delta^{13}C$ → Did crop water stress increase?

And therefore (how) did climate change and water availability affect food security?


60°E
65°E
70°E
75°E
80°E
35°N
30°N
25°N
20°N
Harappa
Dabli-vas-Chugta
Burj
Alamgirpur
Masudspur I
Masudspur VII
Mitathal
Tigrana
0 95 190 380 570 760
Kilometers

Impacts, adaptation and resilience

Could crop water stress have undermined food security? Did this increase with climate change?

Does the evidence support adaptive water management?

Does the evidence support adaptive crop choice?

Do some sites appear to have been more resilient than others?

If so why? Social/tech capacity? Crop assemblage? Environment and resources?

V. HIGHLIGHTS SO FAR

Villages = variable crop water status

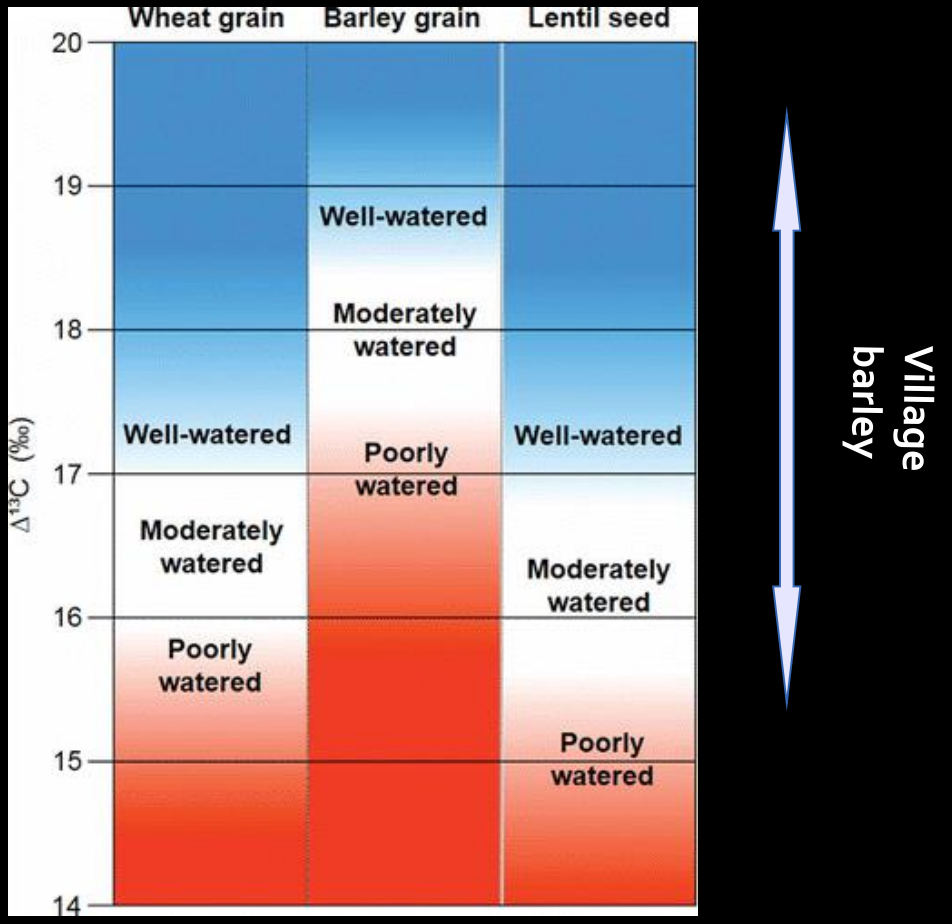
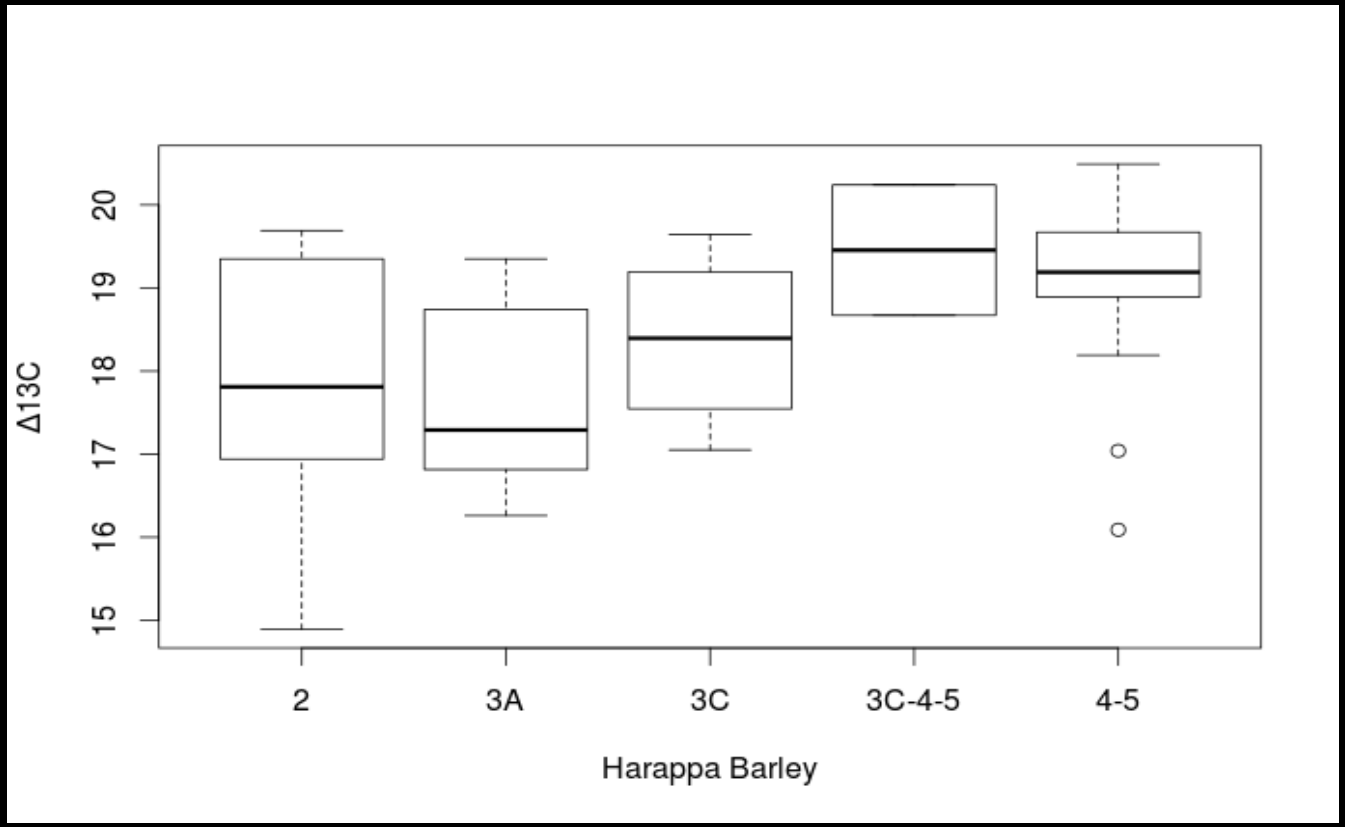


Diagram: Wallace et al. 2013

Harappa = adaptive management?

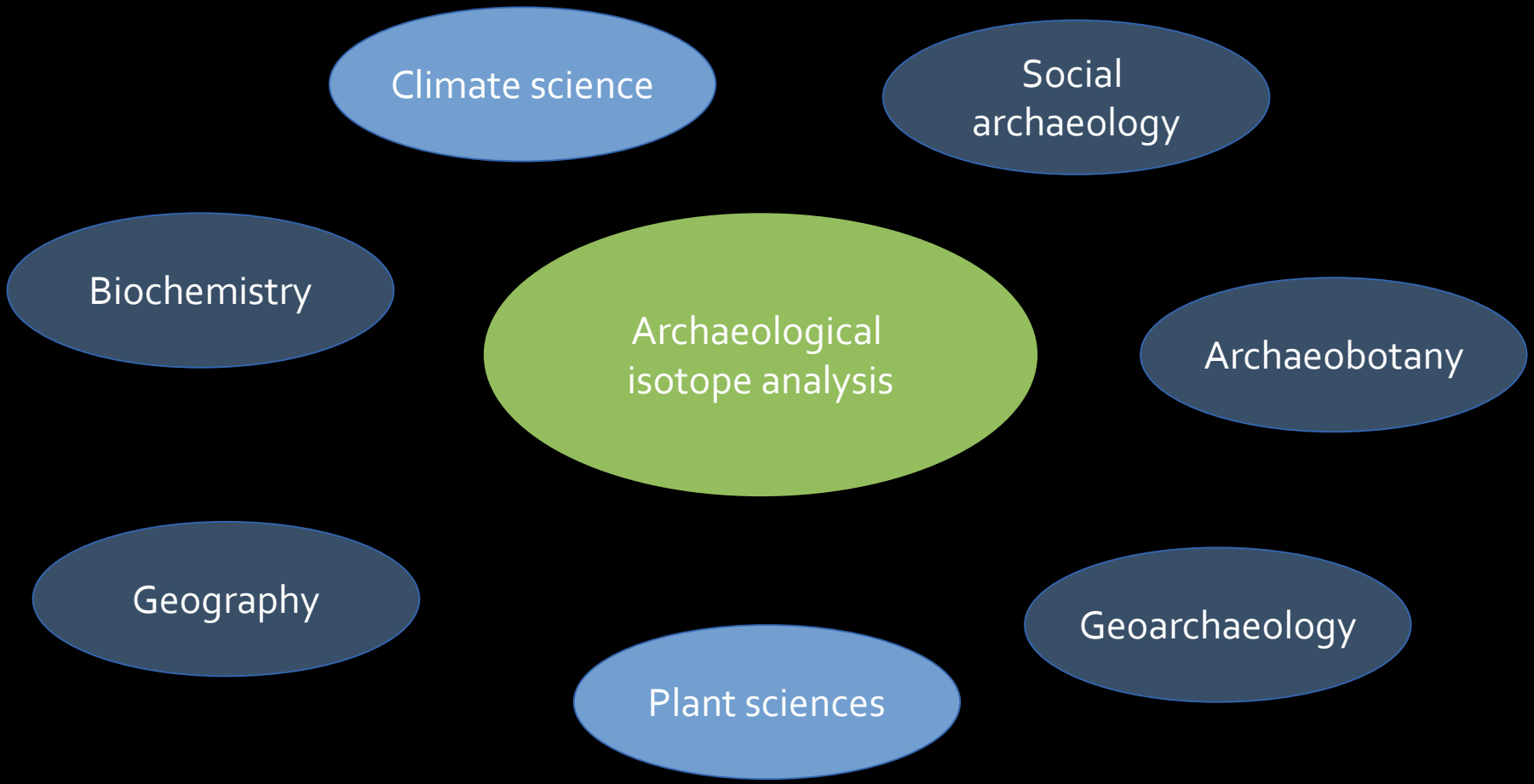


Decreasing water stress →

Decreasing rainfall →

V. COLLABORATIVE OPPORTUNITIES

From foundation to interpretation



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