Discovery Exercises

Module 4, Lesson 6: ASEAN Climate Vulnerability

Foundation level. Two pre-class and two in-class activities. Full worked solutions are at the back: try each activity before you check.

Four activities open the ideas of Lesson 4.6 before, and during, the lecture. The two pre-class tasks take 15 to 20 minutes each and you do them alone. The two in-class tasks take 5 to 10 minutes and you do them with others. Nothing here is graded; the point is to think first, then compare your thinking with the worked solution. This capstone lesson points every Module 4 tool at one region, the Association of Southeast Asian Nations (ASEAN), the part of the world where climate turns most directly into financial loss.

PRE-CLASS Why is ASEAN the world's climate risk hotspot?

15 to 20 min, work on your own, pen and paper

Based on: guided discovery (Mayer 2004)

The lesson's master formula is Risk = Hazard × Exposure × Vulnerability. **Hazard** is how dangerous the climate is (typhoons, floods, heat). **Exposure** is how much value is in harm's way (people, farms, coastlines). **Vulnerability** is how much a shock hurts (low income, little insurance, weak defences). Because the three are *multiplied*, a region only scores high overall if it scores high on all three.

1. Using the indicators from the lesson (tropical hazard: typhoons, monsoon flooding, sea-level rise; exposure: long coastlines, delta populations, a large agricultural share of output; vulnerability: middle incomes, thin insurance, limited early warning), does ASEAN score high, medium, or low on each of the three dimensions? Write one word for each.
2. ASEAN insurance penetration is only about 1 to 4 percent of GDP, against 40 to 60 percent in developed markets. Which of the three dimensions does low insurance belong to, and why does it make a given flood *more* costly to a bank?
3. Because the three factors multiply, what would happen to the overall risk if just *one* of them were low (say, if ASEAN had developed-market insurance)? State in one sentence why multiplication, not addition, is the key to the formula.

Your attempt (before you check the solution at the back):

PRE-CLASS Size the adaptation finance gap yourself

15 to 20 min, work on your own, pen and paper (optional spreadsheet stretch)

Based on: productive failure (Kapur 2008)

Try this *before* the lecture states the gap. **Mitigation** finance pays to *cut* emissions (solar, electric vehicles). **Adaptation** finance pays to *cope* with warming already locked in (flood defences, drought-resilient crops, early warning). ASEAN needs far more adaptation than it gets.

Work with these *illustrative* figures. They are teaching values, not a sourced ASEAN estimate:

published adaptation-gap numbers differ by more than a factor of two depending on scope, and the widely quoted $40 billion is ADB's Asia-wide figure, which covers more than ASEAN. The arithmetic reveals the imbalance. ASEAN adaptation *needs*: about $40 billion per year. ASEAN adaptation *received*: about $5 billion per year. Global climate finance averaged about $1.3 trillion a year in 2021/2022, of which adaptation drew about $63 billion, under 5 percent.

1. Compute the ASEAN adaptation *gap* (needs minus received) in dollars per year, and express the need-to-supply ratio as a simple "X to 1".
2. Adaptation drew about $63 billion of the $1.3 trillion global total. What share is that, and roughly what is the ratio of everything else to adaptation?
3. Even if every dollar of the world's $63 billion adaptation finance flowed to ASEAN, would it cover ASEAN's $40 billion need? Before you were told any numbers, you have just discovered why adaptation is chronically under-funded. State the imbalance in one sentence.

Your attempt (before you check the solution at the back):

Optional stretch

In a spreadsheet, model the gap closing. Start supply at $5 billion growing 3 percent a year; start need at $40 billion growing 7 percent a year. Project ten years. Does the gap narrow or widen? This is why the lesson says the gap is *growing*, not shrinking.

IN-CLASS Which of the three countries is most vulnerable?

5 to 10 min, think-pair-share

Based on: predict then reveal, testing effect (Roediger and Karpicke 2006)

Vietnam, Thailand, and the Philippines face different climate risks. "Most disaster-prone" and "most vulnerable" are not the same thing: vulnerability also depends on income, insurance, and how ready the country is to cope. In this activity you predict the ranking before your instructor reveals the lesson's country-comparison chart. The **ND-GAIN** index (Notre Dame Global Adaptation Initiative) ranks countries by vulnerability and readiness, where a *higher* rank number means *more* vulnerable.

1. **Predict (1 minute, on your own).** Rank the three countries from most to least climate-*vulnerable*. Use these clues: the Philippines takes 20-plus typhoons a year (about 3.2% of GDP in annual losses); Vietnam's Mekong Delta is slowly drowning (sea-level rise, saltwater, subsidence) with only about 1.2% insurance penetration; Thailand has the highest insurance penetration of the three (about 3.8%) and the strongest institutions.

   Most vulnerable _____ > _____ > _____ least

2. **Pair (2 minutes).** Compare with a neighbour. Agree on one sentence: why might the *most disaster-prone* country (the Philippines) not be the *most vulnerable* overall?
3. **Share and reveal.** Your instructor shows the three-country comparison table from the lesson. Were you right? State the one rule about why insurance and institutions can matter as much as raw hazard.

IN-CLASS Pricing a Mekong Delta farm loan for flood risk

5 to 10 min, small groups of 3 to 5

Based on: data and case interrogation, active learning (Freeman et al. 2014)

Physical climate risk is not abstract for a Mekong Delta bank; it shows up directly in loan defaults. Work as a group with a real ASEAN case. Recall the loss idea: a higher **probability of default** (PD, the chance a borrower fails to repay) means the bank must charge more, or lose money.

From the case study: Vietnam, Mekong Delta agricultural lending (case study 4)

In the Mekong Delta, agricultural loan default rates rise by about 8 percentage points in a major flood year in flood-exposed communes. Agribank, the dominant rural lender, holds a large, geographically concentrated share of delta farm credit. Base agricultural lending rates run about 6 to 8 percent, and are often subsidised for small farmers.

1. **Vote first (no arithmetic).** As a group: should a bank charge a *higher* interest rate on farm loans in flood-exposed communes than in safe ones? Agree on yes or no.
2. **Now estimate.** A rough rule: each 1 percentage point of extra expected default needs about 1 percentage point of extra interest to break even. If floods add 8 points to the default rate, how many points must the bank add to a base rate of, say, 8 percent? What is the "risk-adjusted" rate?
3. Your answer is a rate around 15 to 16 percent. Is that politically and practically workable for smallholder farmers? Give one sentence on the problem, and name one alternative (other than a very high rate) that the case suggests could manage the risk instead.

Full Solutions

Try each exercise on your own before you read its solution.

Solution: Why is ASEAN the world's climate risk hotspot?

1. ASEAN scores **high on all three**: high hazard (tropical, in the path of typhoons, monsoon floods, and sea-level rise), high exposure (long coastlines, agriculture 10 to 25 percent of GDP, most people in coastal or delta zones), and high vulnerability (moderate incomes, insurance only 1 to 4 percent of GDP, limited early-warning infrastructure).
2. Low insurance belongs to *vulnerability*. When little is insured, an uninsured flood loss flows straight through the borrower to the bank as a default and a low recovery, so the same flood costs the bank far more.
3. Because the three multiply, making just one of them low would pull the whole product down sharply: developed-market insurance alone would cut the vulnerability factor and so cut total risk substantially. Multiplication means a single weak link (or a single strength) moves the result far more than it would under addition.

Common misconception. That a rich country and a poor country facing the same storm face the same financial risk. Equal hazard and exposure still give very different risk because vulnerability (income, insurance, defences) multiplies in, and it is far higher in under-insured ASEAN.

Solution: Size the adaptation finance gap yourself

1. Gap = \$40B − \$5B = \$**35**B per year. The need-to-supply ratio is $40 : 5 = \mathbf{8 : 1}$. Note which ratio you are quoting: need-to-supply is 8:1, while gap-to-supply is 35:5, that is 7:1. Both are defensible and they are not the same statement, which is a small example of why adaptation-gap figures are so easy to misquote.
2. Adaptation share = \$63B/\$1.3T ≈ 4.8%. Everything else outpaces adaptation by about **20 to 1**.
3. The world's entire adaptation finance (\$63B) would, in principle, exceed ASEAN's \$40B need, but ASEAN receives only about \$5B of it, so the problem is not the global total but how little reaches ASEAN. The imbalance: globally, everything else outpaces adaptation by roughly 20 to 1, leaving physically exposed regions like ASEAN chronically short of the adaptation finance they most need.

Common misconception. That cutting emissions (mitigation) is enough to keep ASEAN safe. Even under Net Zero, warming already locked in still brings floods and storms, so adaptation is a survival need, yet it attracts only about 7 percent of global climate finance.

Solution: Which of the three countries is most vulnerable?

The order is **Vietnam** > **Philippines** > **Thailand**, most vulnerable first. Vietnam is the most vulnerable, Thailand the most prepared, and the Philippines is between, being the most disaster-prone but not the most vulnerable overall.

Why the most disaster-prone is not the most vulnerable: the Philippines takes the most hazard (20-plus typhoons a year) but has somewhat higher insurance and readiness than Vietnam, whose slow, largely uninsurable drowning of the Mekong Delta (only about 1.2% insurance penetration) and weaker readiness push its vulnerability higher. The rule: vulnerability

combines hazard with the capacity to cope, so insurance and institutions can matter as much as the raw number of storms.

Common misconception. That the country hit by the most disasters must be the most vulnerable. Vulnerability also depends on income, insurance, and readiness, so Vietnam ranks more vulnerable than the more frequently struck Philippines.

Solution: Pricing a Mekong Delta farm loan for flood risk

1. Yes: a loan in a flood-exposed commune has a higher expected default, so on pure risk grounds it should be priced above an identical loan in a safe area.
2. Using about 1 point of rate per 1 point of extra default: floods add 8 points, so the bank must add about 8 points to the 8 percent base, giving a risk-adjusted rate of about **16 percent**.
3. A 16 percent rate is not workable for smallholder farmers: it is politically unacceptable and would cut off credit access, pushing farmers out of the formal market. The case's alternative is to manage the risk another way. Examples are parametric crop insurance (to cut the loss), government interest subsidies, or concentration limits on typhoon-corridor and flood-corridor lending.

Common misconception. That a bank can price any climate risk into the interest rate. For heavily exposed, low-income borrowers the break-even rate becomes so high it destroys the market, so climate risk must be managed with insurance, subsidies, and limits, not priced away.

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