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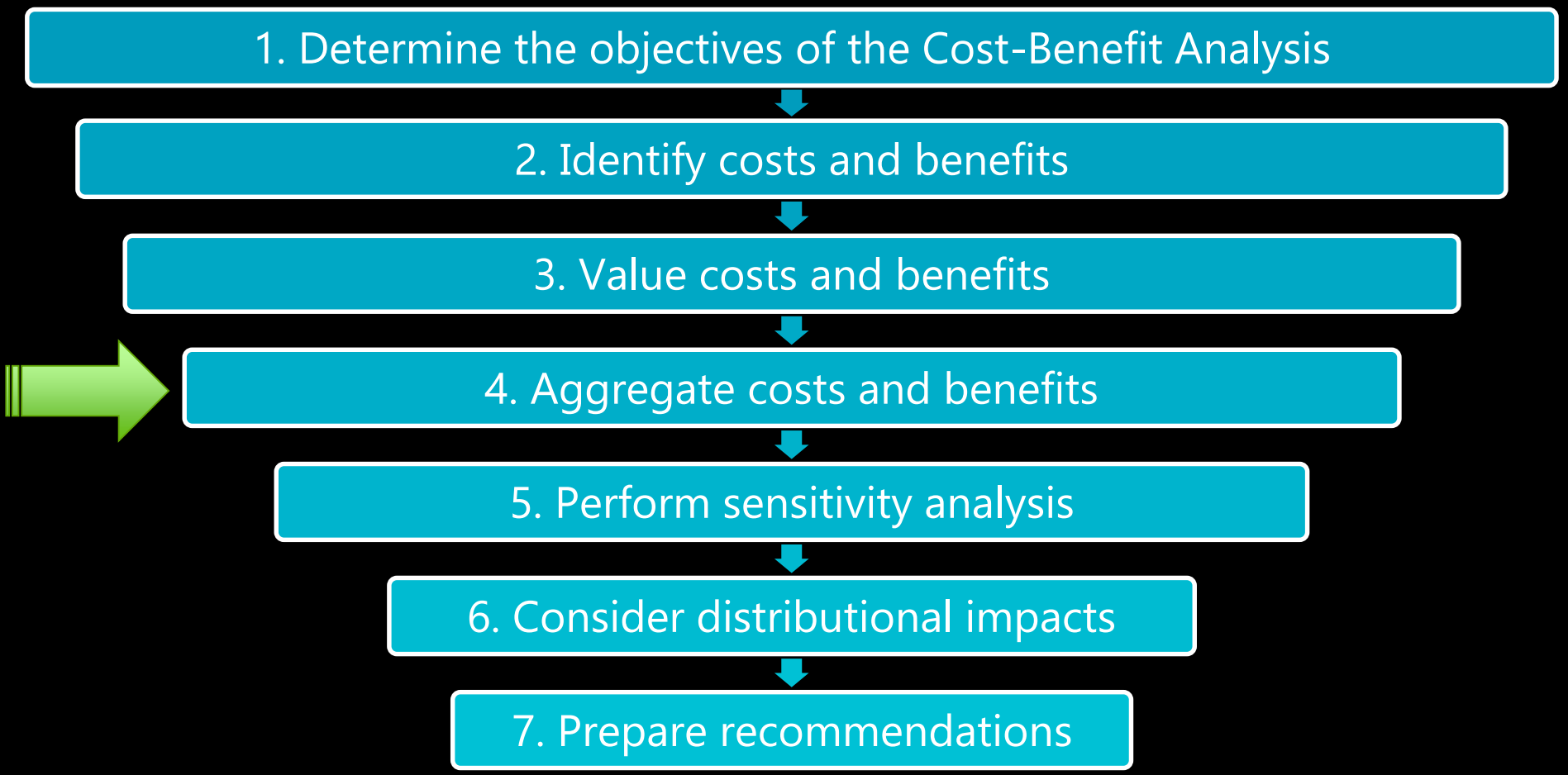
Refining CBA

Discounting

To get us started…

https://www.youtube.com/watch?v=QX_oy9614HQ

7 Steps in conducting a CBA



Accounting for discounting [step 4]

- Projects often stretch over many years
  - We need a mechanism to value costs and benefits in different time periods so we can compare projects
- **Discounting** is how we value something in the future today
- There are four reasons why $1 tomorrow may be worth less than $1 today:
  1. Time preference
  2. Interest/opportunity cost of capital
  3. Uncertainty/risk
  4. Inflation

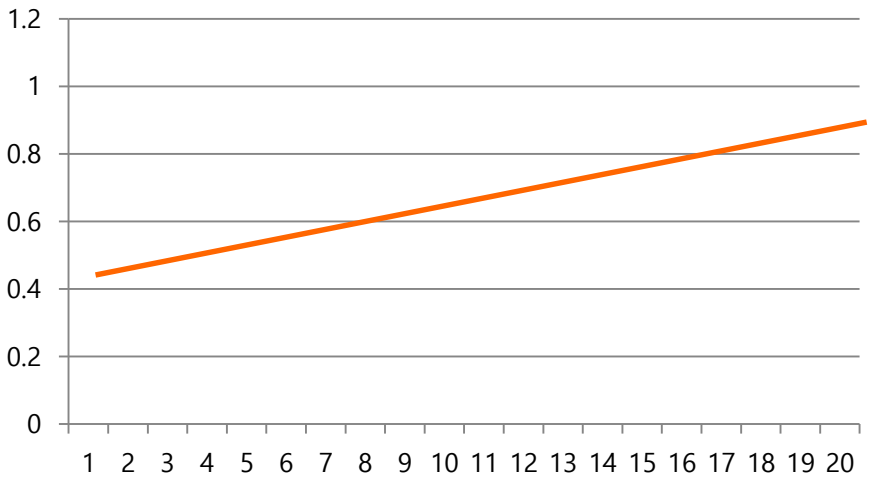
Accounting for discounting

- Put $100 in the bank with 5% interest on 18/03/18

  18/03/19, you have… $100.00 x (1+0.05) = $105.00
  18/03/20 : $100.00 x (1+0.05) x (1+0.05) = $110.25
  18/03/21: $100.00 x (1.05) x (1.05) x (1.05) = $115.76
  …
  On 24/11/38: $100.00 x (1.05) x (1.05) x (1.05)
  x (1.05) x (1.05) x (1.05) x (1.05) x (1.05) x (1.05)
  x (1.05) x (1.05) x (1.05) x (1.05) x (1.05) x (1.05)
  x (1.05) x (1.05) x (1.05) x (1.05) x (1.05) = $265.33

- The interest compounds over time

  i.e., the interest also earns interest



Accounting for discounting

The **future value** (*FV*) of a an amount today is:

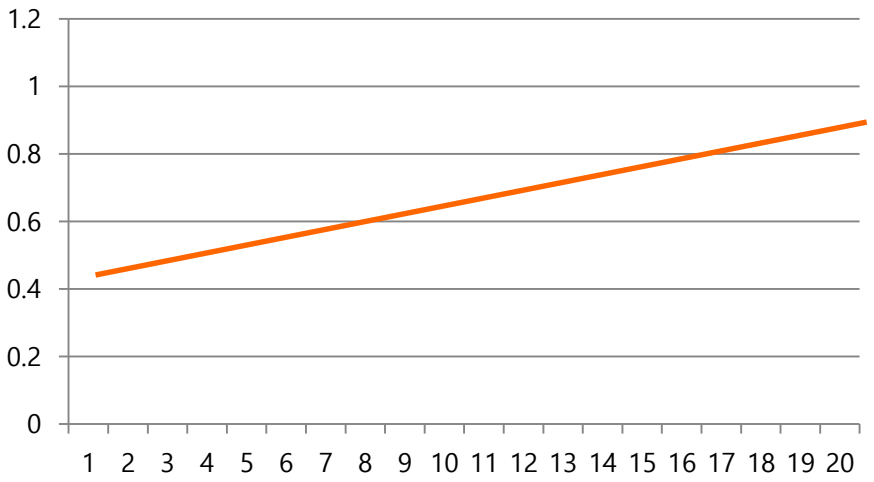
$FV = amount\ today \times (1+r)^t$

where:

r = **rate of return** or interest

t = length of investment

$$FV = \$100 \times (1+0.05)^{20}$$
$$= \$265.33$$



Accounting for discounting

- Suppose someone promises to pay you $100 *one year from now*
- What is the maximum amount you should be willing to pay today for such a promise?
  - You will forgo interest that you could earn on the money that is being loaned in exchange for $100 in the future
  - The **present value** (*PV*) of a future amount of money is the maximum amount you would be willing to pay today for the right to receive that money in the future

$$PV = \frac{\$final\ amount}{(1+r)^t}$$, where r is the **discount rate**

Also called "social discount rate"

"impatience"

Accounting for discounting

- What is the value of $1,000,000 in 20 years if the discount rate is 5%?

$$PV = \frac{\$1,000,000}{(1+0.05)^{20}} =$$

- What is the value of $1,000,000 in 20 years if the discount rate is 10%?

$$PV = \frac{\$1,000,000}{(1+0.10)^{20}} =$$

- What is the value of $1,000,000 in 20 years if the discount rate is 15%?

$$PV = \frac{\$1,000,000}{(1+0.15)^{20}} =$$

Interpretation: With a discount rate of 15%, the government is **indifferent** between spending **$61,100 today** and **$1,000,000 in 20 years**.

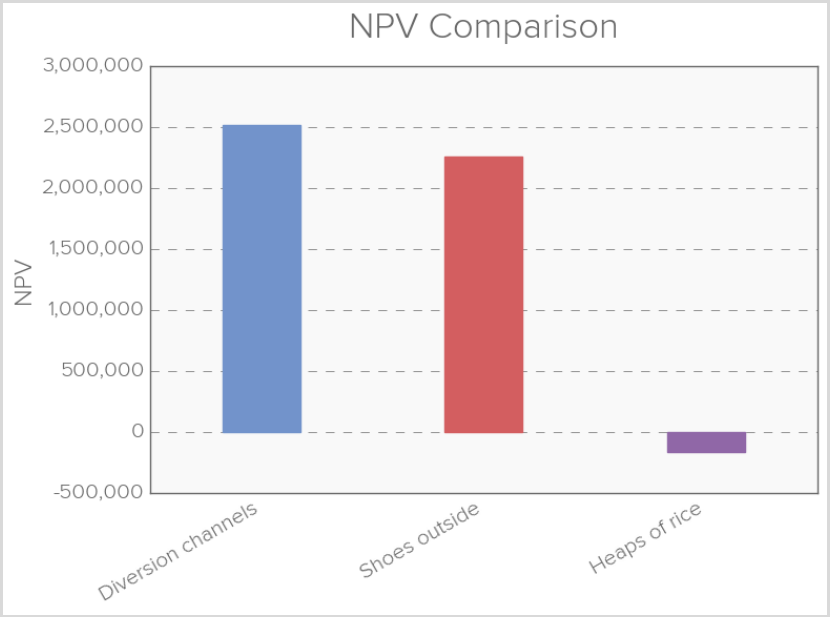
Accounting for discounting

- **Net Present Value** (*NPV*) is the present value of a project's benefits less the present value of its costs:

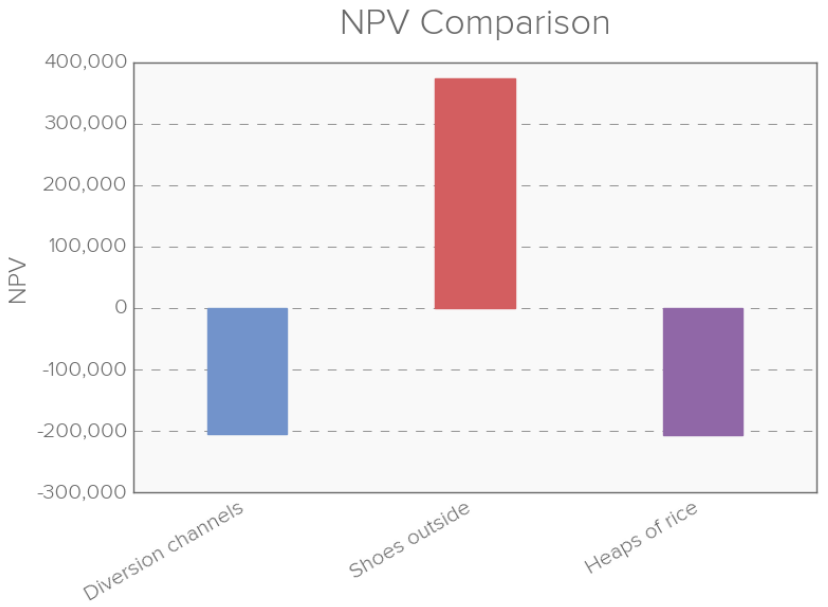
$$NPV = PV_{benefits} - PV_{costs}$$

- After discounting, your choice of policies could change!

no discounting



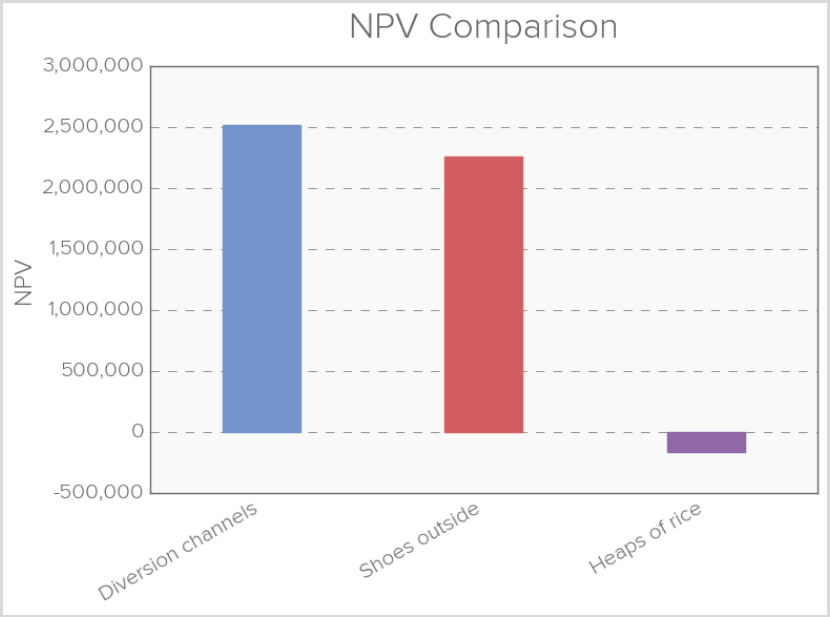
discounting at 6%



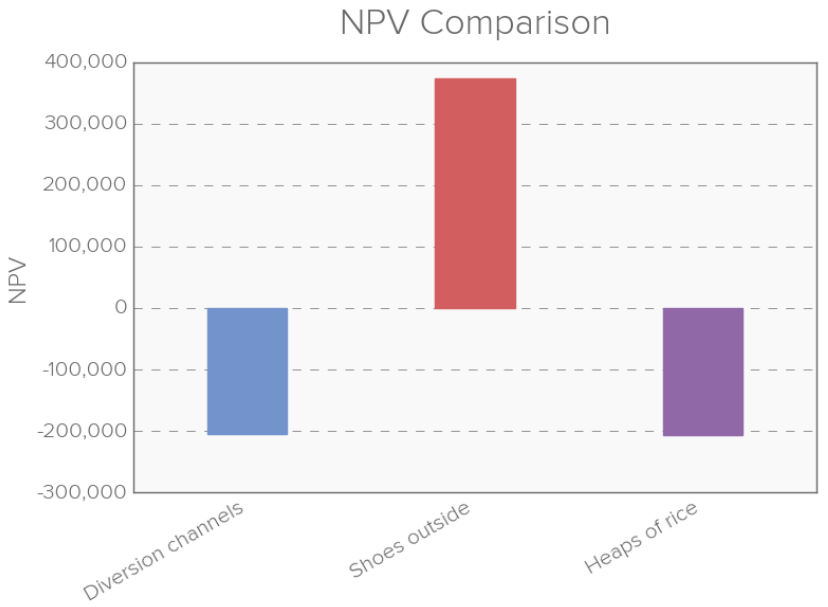
Accounting for discounting

- Discounting is viewed as controversial by some because it makes projects with high initial costs and far distant benefits look less attractive
  - Project supporters will argue for using a lower discount rate. Detractors will argue for using a higher discount rate.

no discounting



discounting at 6%



Accounting for discounting

- Discount rates are *not* controversial among economists
  - They simply reflect the value of time
  - Discount rate for environmental projects in the US = 7%
  - In New Zealand = 8%
  - In Mexico = 12%
- For Seychelles, World Bank recommends 6%-7%

- The discount rate should **never** vary from one project to another

More on Discounting

https://www.youtube.com/watch?v=Mol1yT7tczY