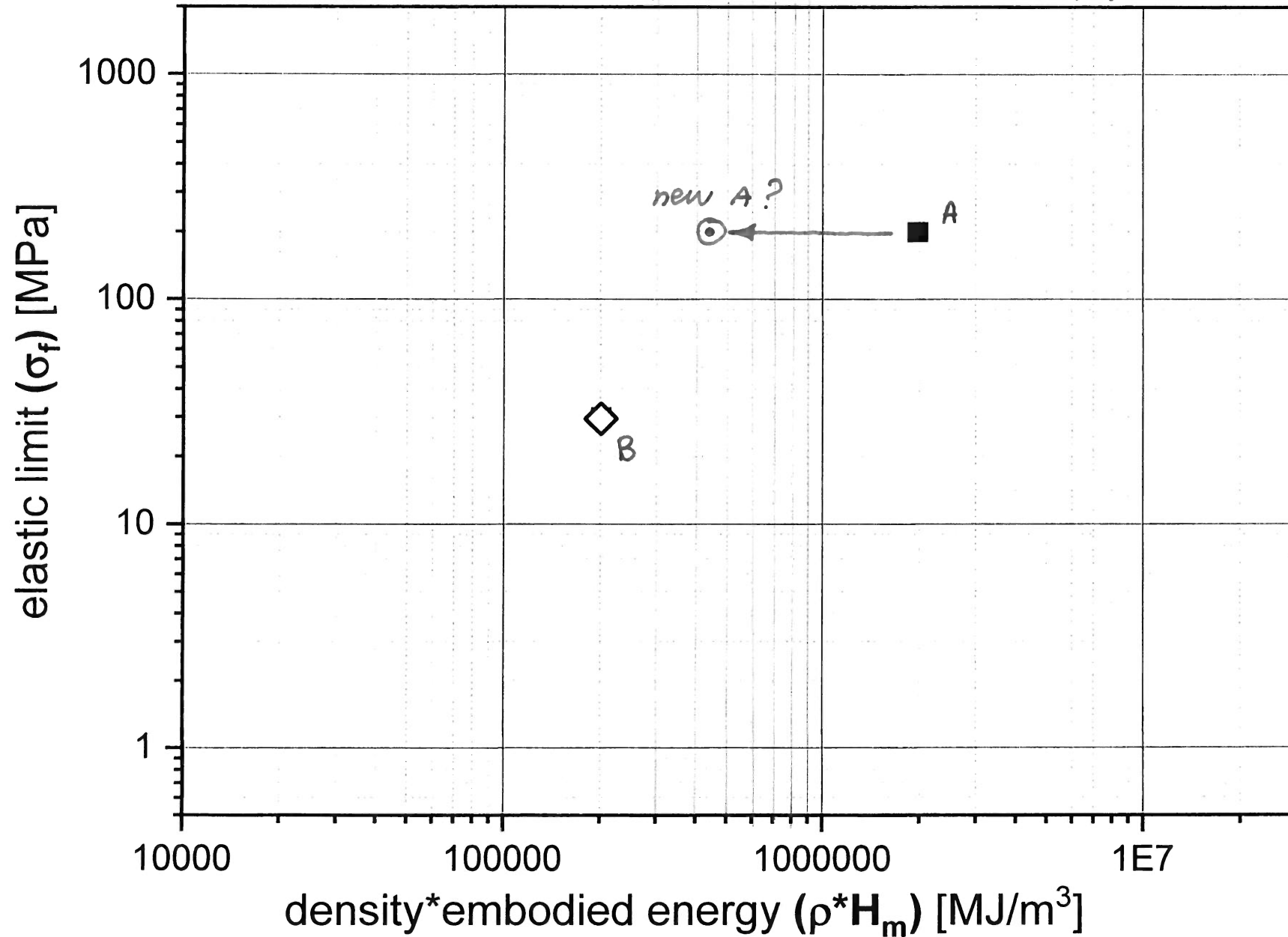


- 1
- i) SHOW THAT A IS LESS SUSTAINABLE THAN B FOR STRONG PANELS (UNDER BENDING)
 - ii) A AND B COME FROM VIRGIN RAW MATERIALS ; ESTIMATE THE REDUCTION OF EMBODIED ENERGY FOR A TO BE AS SUSTAINABLE AS B
 - iii) NEGLECT ENERGY DISSIPATION WITH DISPOSAL, IF THE EMBODIED ENERGY FROM RECYCLED MATERIAL FOR MATERIAL A IS $H_R = 0.1 \cdot H_m$, ESTIMATE THE RECYCLING RATE TO REALIZE A AS SUSTAINABLE AS B



RATE TO
REALIZE
A AS
SUSTAINABLE
AS B

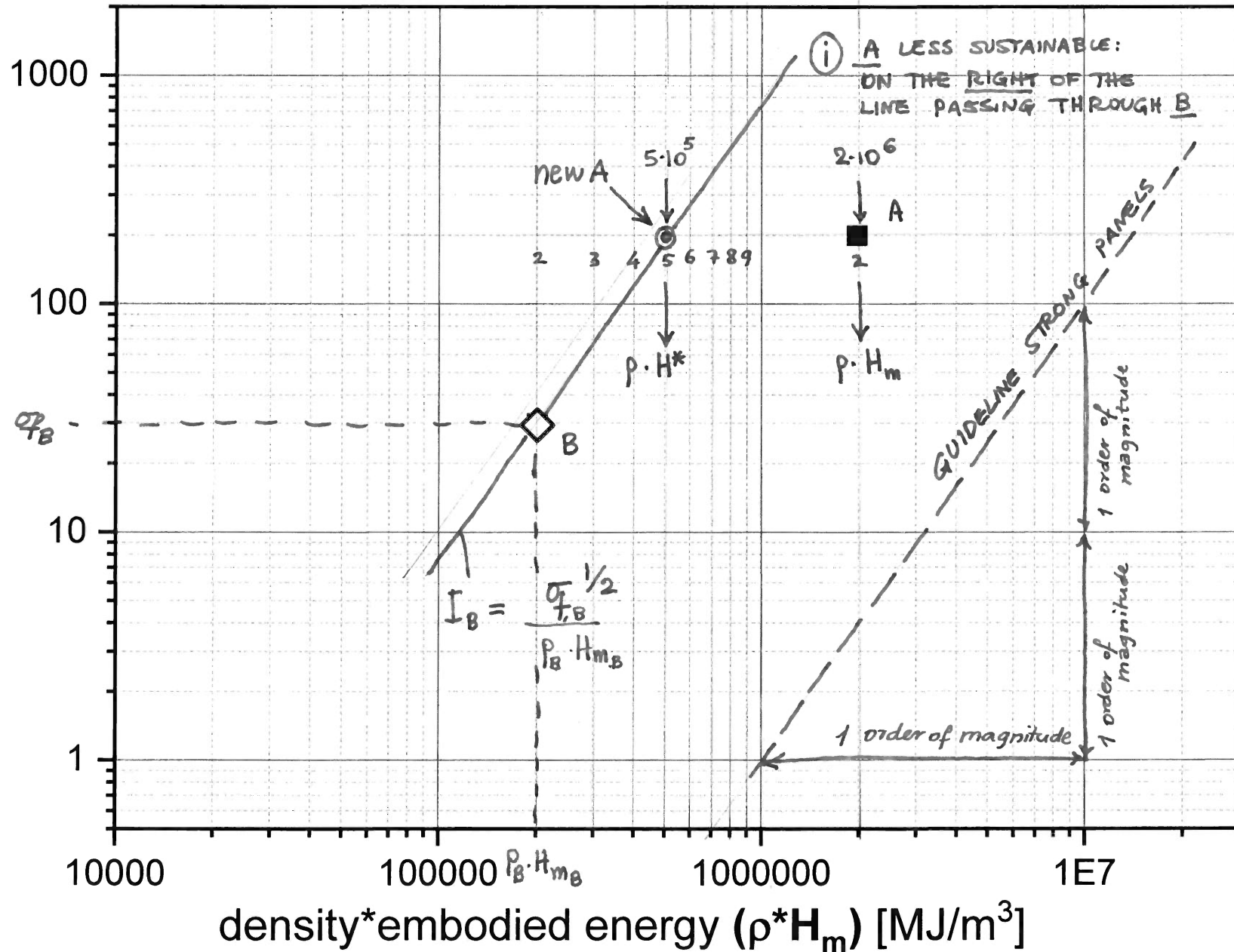
ii

new A AS SUSTAINABLE
AS B: STAYING ON THE
SAME LINE

$$\frac{\rho \cdot H^*}{\rho \cdot H_m} = \frac{5 \cdot 10^5}{2 \cdot 10^6} = 0.25$$

$$H^* = 0.25 H_m \rightarrow \text{REDUCTION OF 75\%}$$

elastic limit (σ_f) [MPa]



iii

$$\begin{cases} H_R = 0.1 H_m \\ H^* = (1-r) H_m + r H_R \\ H^* = 0.25 H_m \end{cases}$$

$$0.25 \cdot H_m = (1-r) \cdot H_m + 0.1r \cdot H_m$$

$$0.25 = (1-r) + 0.1r$$

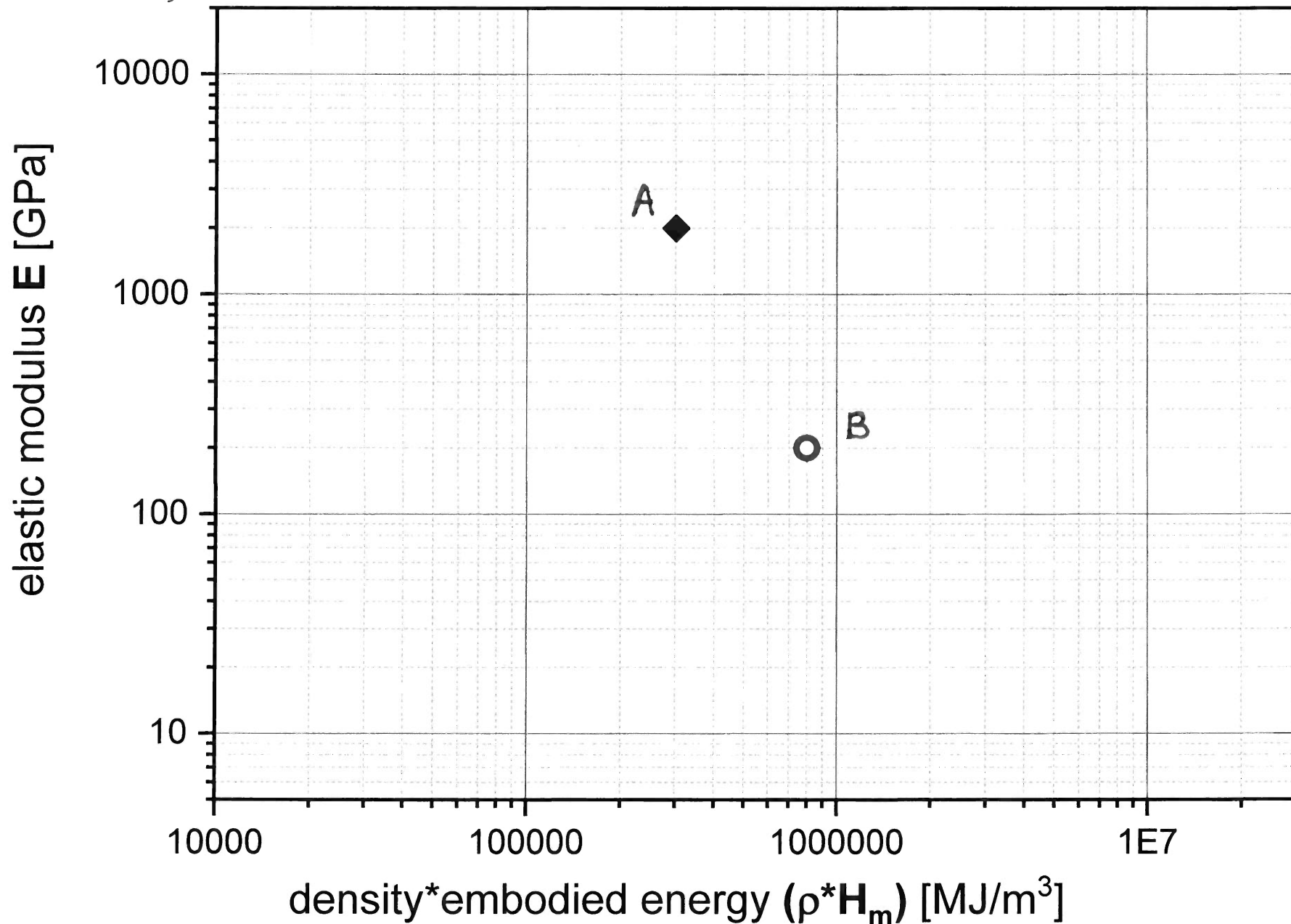
$$r = 0.83$$

$$= 83\%$$

2

CONSIDER STIFF AND LIGHTLY IMPACTING PANELS

- 1) SHOW THE MATERIALS SELECTION INDEX TO BE USED; TRACE A GUIDELINE
- 2) CHOOSE THE MOST SUSTAINABLE MATERIAL; 3) FOR THE LESS SUSTAINABLE



FIND THE REDUCTION OF EMBODIED ENERGY NECESSARY TO HAVE EQUIVALENT MATERIALS (PROVIDE AN ESTIMATION)

$$\log I = \frac{1}{3} \log E - \log(p \cdot H_m)$$

SEE GUIDELINE

$$I_A = \frac{E_A^{1/3}}{\rho_A H_{mA}} > \frac{E_B^{1/3}}{\rho_B H_{mB}} = I_B$$

3) **B'** AS SUSTAINABLE AS A



$$= 19\%$$

GUIDELINE FOR

$$I = \frac{E^{1/3}}{PH_m}$$

SLOPE 3

1 step

1 step

 1.10^6

7 1 step

A

2 / 3 4 5 6 7 8

 $1 \cdot 10^5$

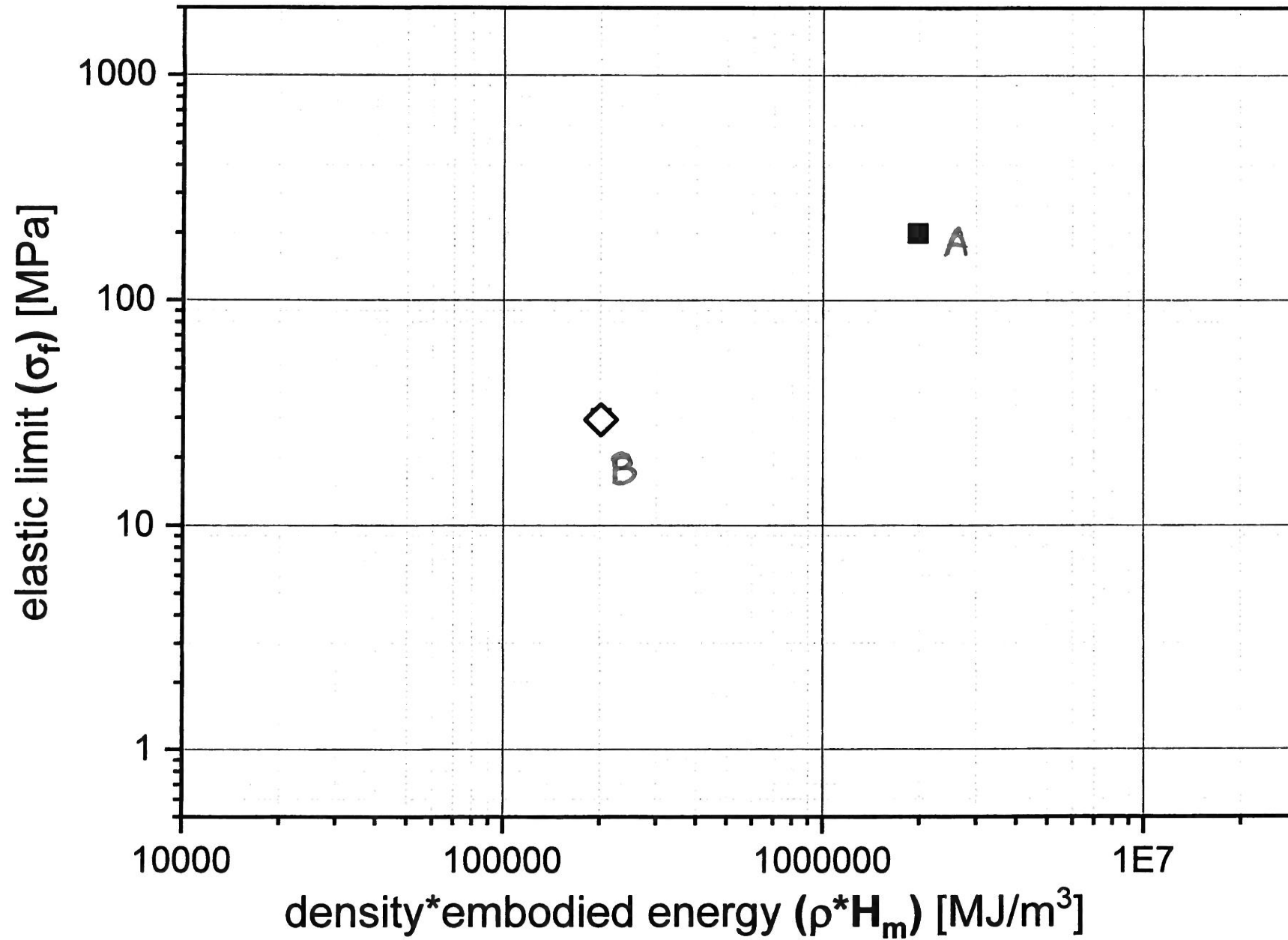
2

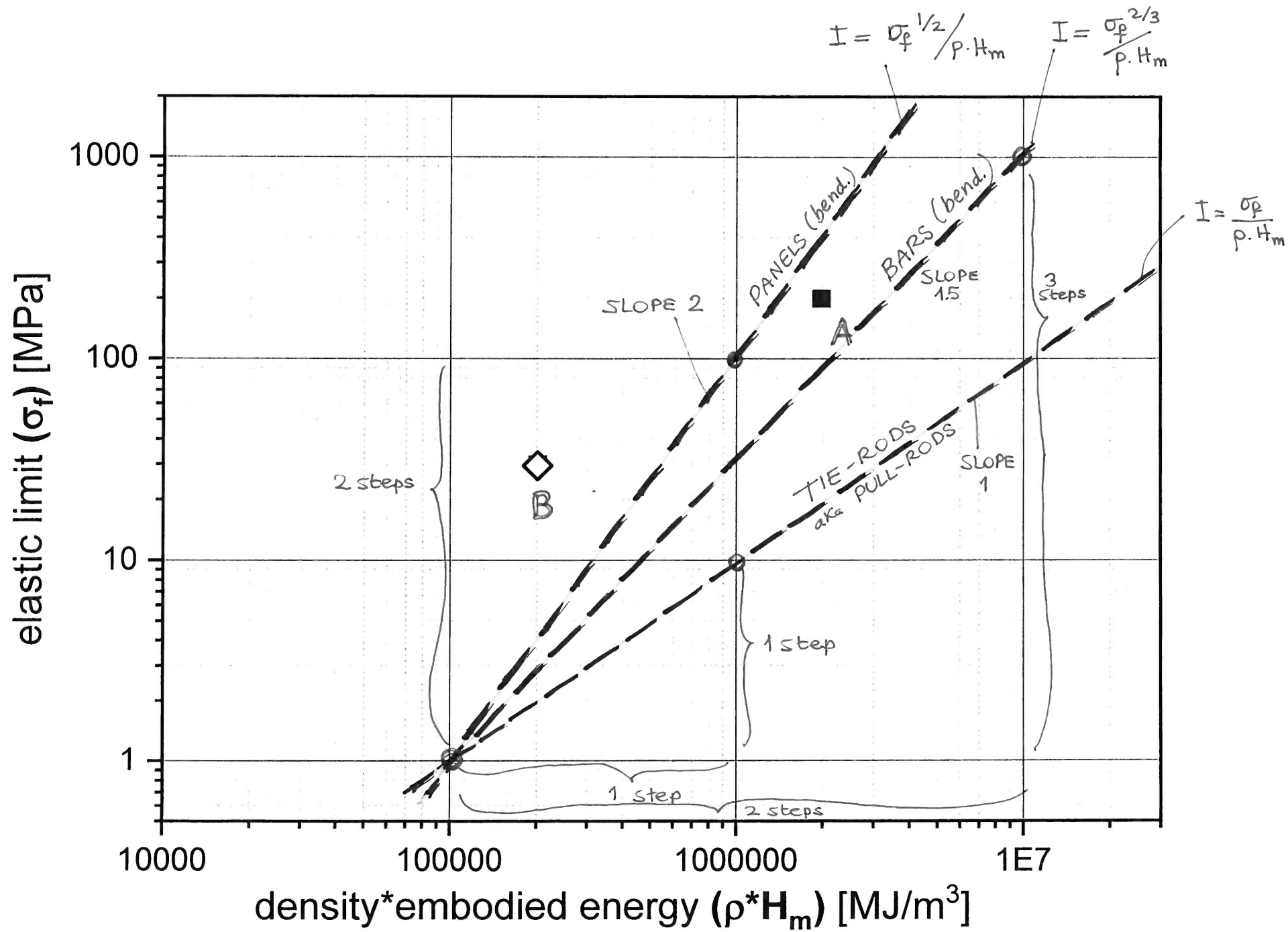
2

1 step

3

IN WHAT APPLICATION IS A AS SUSTAINABLE THAN B?





B ALWAYS MORE SUSTAINABLE THAN A
 BUT FOR PULL-RODS $I_A = \frac{\sigma_{fA}}{\rho_A H_{mA}} \sim \frac{\sigma_{fB}}{\rho_B H_{mB}} = I_B$

