

Figure S1. System boundary of r-PET insulation sheet and VIP pouch.

Table S1. Transportation distance of EPS box.

Transportation	km	Description
Transport of raw materials	500	From EPS material supplier to EPS box manufacturing plant
Transport of box	120	From EPS box manufacturing plant to fresh food manufacturing plant
Transport of box with fresh food and ice pack	41	From fresh food manufacturing plants to consumers near the market (average distance according to distribution ratio by distributor)
Transport of box for recycling	15	From consumers to EPS box recycling company

Table S2. Transportation and Reconditioning transportation distance of VIP box.

		km	Description
Transportation	Transport of r-PET flake	75	From flake supplier to bale manufacturing plant (average distance)
		5	From bale manufacturing plant to sheet manufacturing plant
	Transport of VIP film	2838	From overseas film pouch factory to domestic VIP pouch manufacturing facility
	Transport of VIP pouch	4084	From domestic VIP pouch manufacturing facility to overseas VIP box manufacturing facility
	Transport of box	3935	From overseas VIP box manufacturing facility to domestic distribution center
	Transport of box for treatment	15	From consumers to box treatment center (average distance)
Reconditioning transportation	Transport of box with fresh food	44	From domestic distribution center to sub-terminal (average distance)
	Transport of box with fresh food and ice pack	8.7	From domestic sub-terminal to customers (average distance)
	Transport of box for washing	8.7	From customers to sub-terminal (average distance)
	Transport of box for recovery	60	From customers to domestic recovery center (average distance)
	Transport of box for reuse after recovery	65	From recovery center to domestic fulfillment center (average distance)

Table S3. Transportation and Reconditioning transportation distance of EPE box.

		km	Description
Transportation	Transport of box material and box	1798	From overseas box material manufacturing plant to box manufacturing plant and then to domestic distribution center
	Transport of box for treatment	15	From consumers to box treatment center (average distance)
Reconditioning transportation	Transport of box with fresh food	44	From domestic distribution center to sub-terminal (average distance)
	Transport of box with fresh food and ice pack	8.7	From domestic sub-terminal to customers (average distance)
	Transport of box for washing	8.7	From customers to sub-terminal (average distance)
	Transport of box for recovery	60	From customers to domestic recovery center (average distance)
	Transport of box for reuse after recovery	65	From recovery center to domestic fulfillment center (average distance)

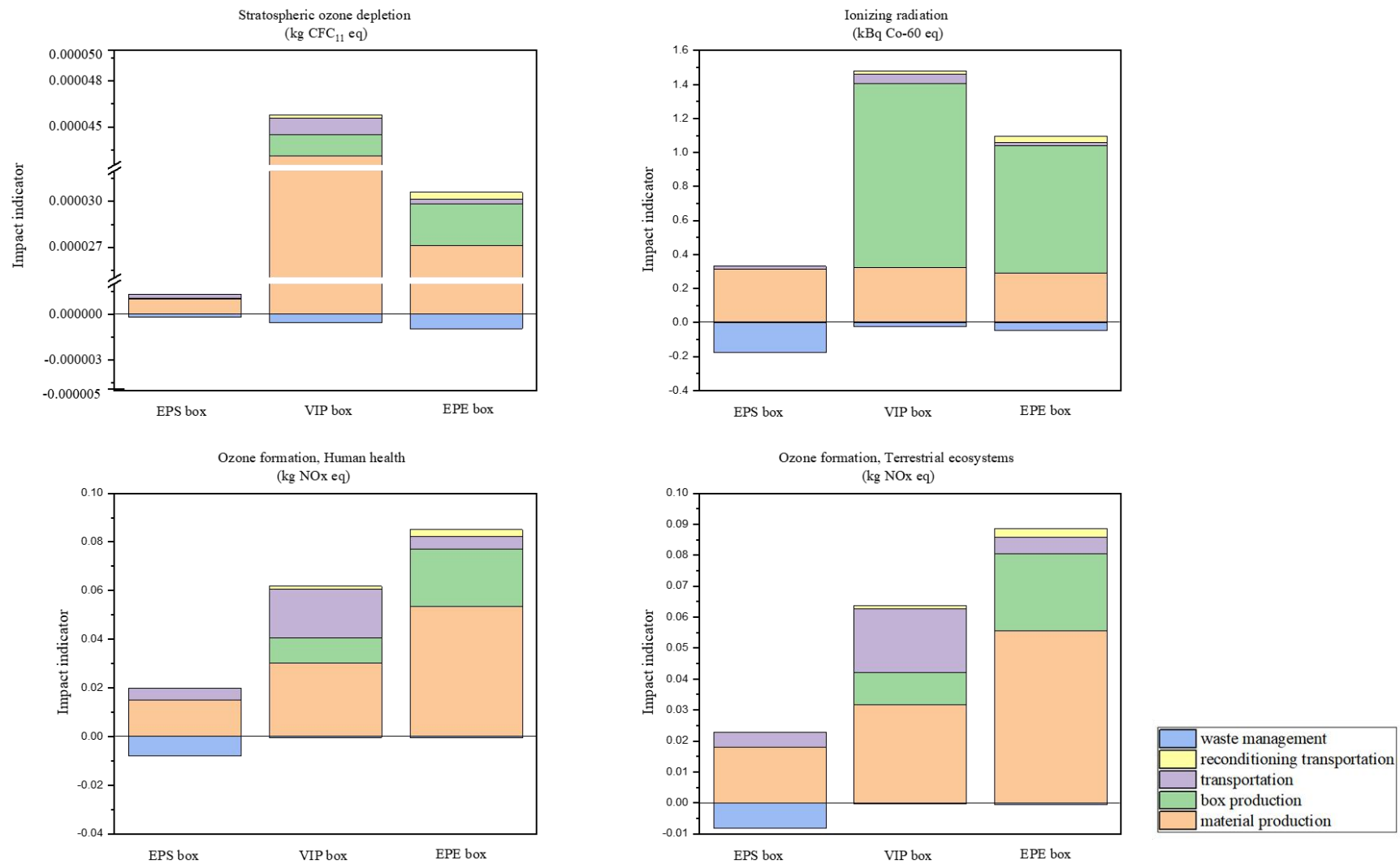


Figure S2. Potential impact results for scenarios 1 (1cycle).

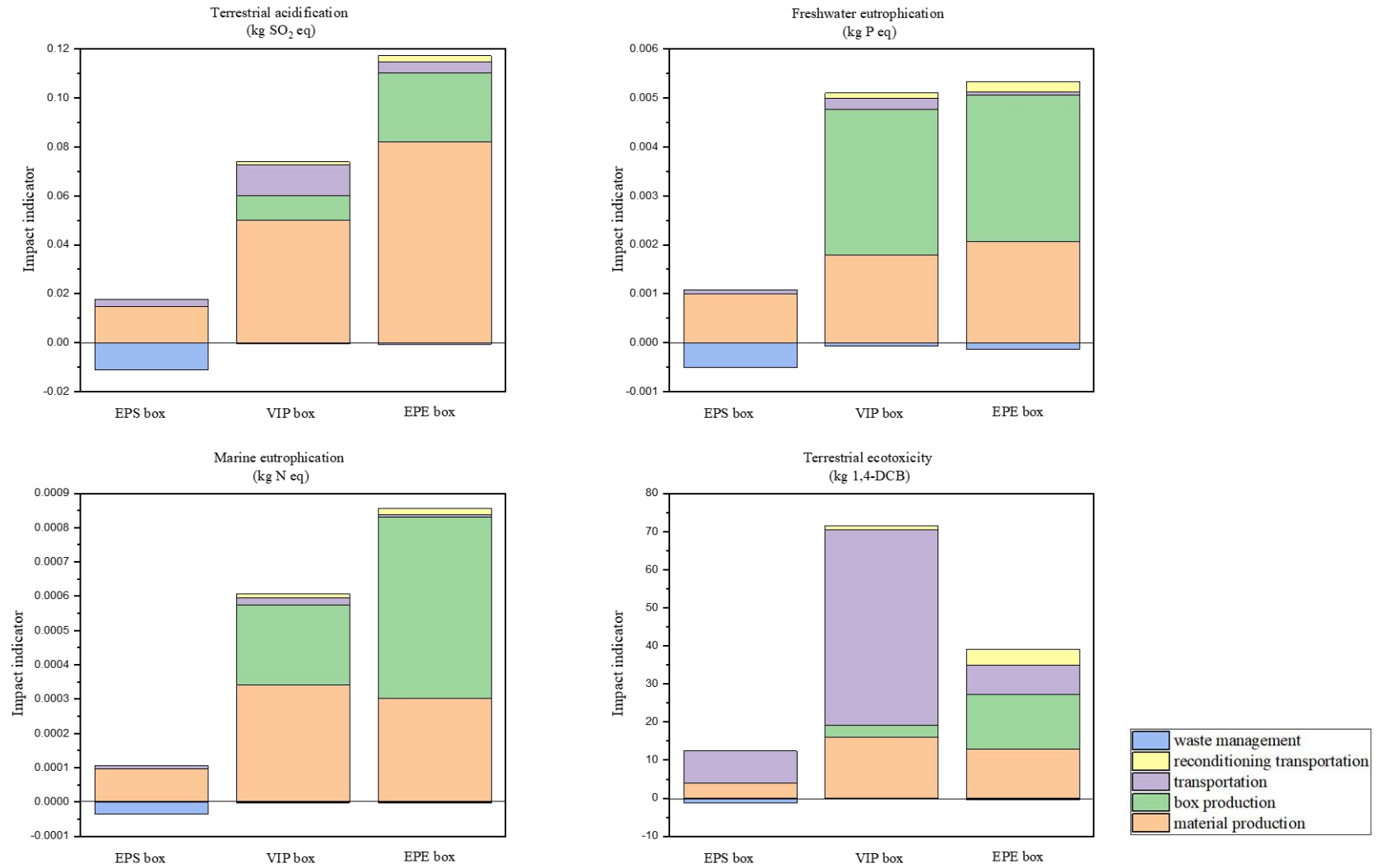


Figure S3. Potential impact results for scenarios 2 (1cycle).

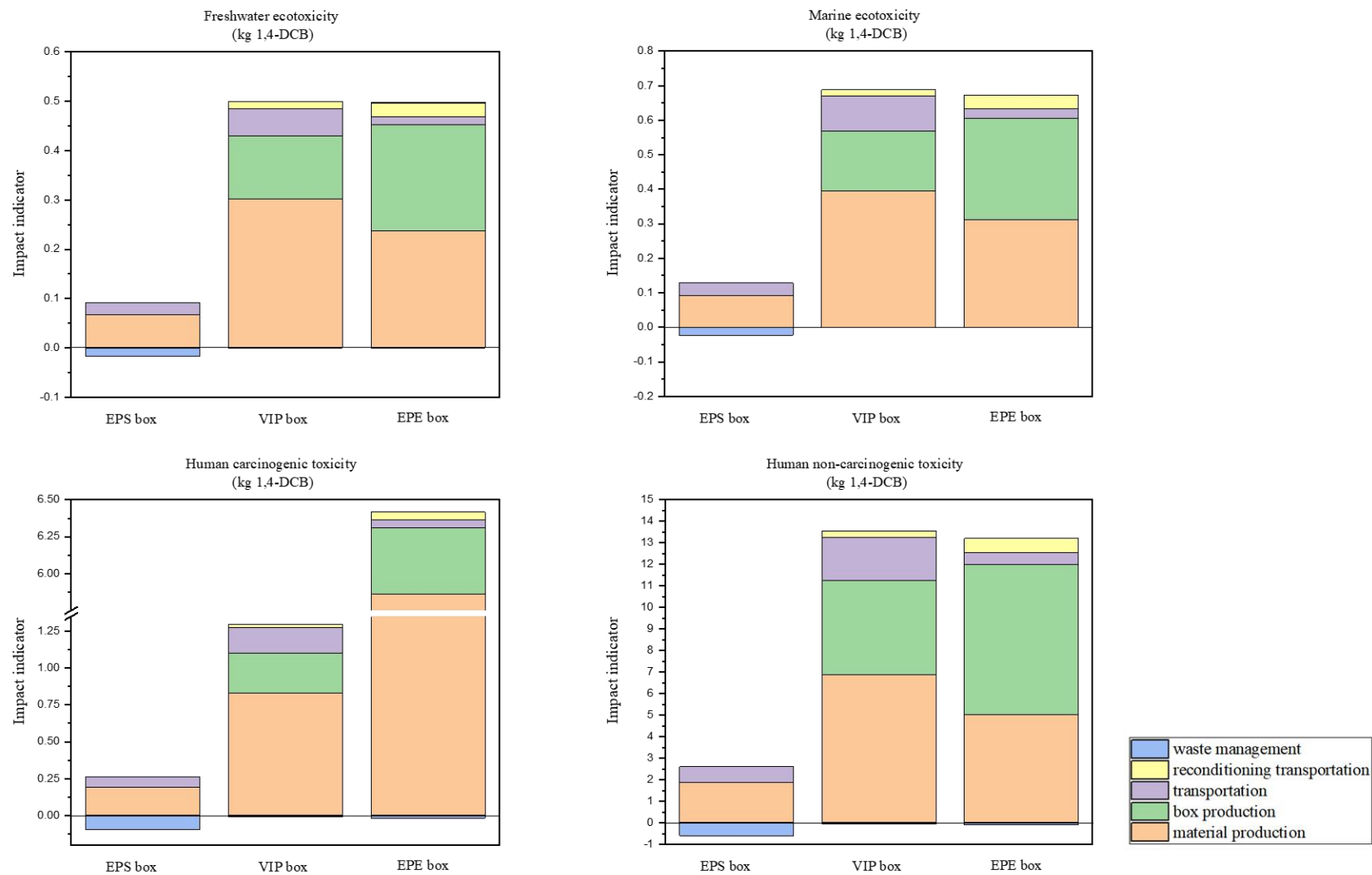


Figure S4. Potential impact results for scenarios 3 (1 cycle).

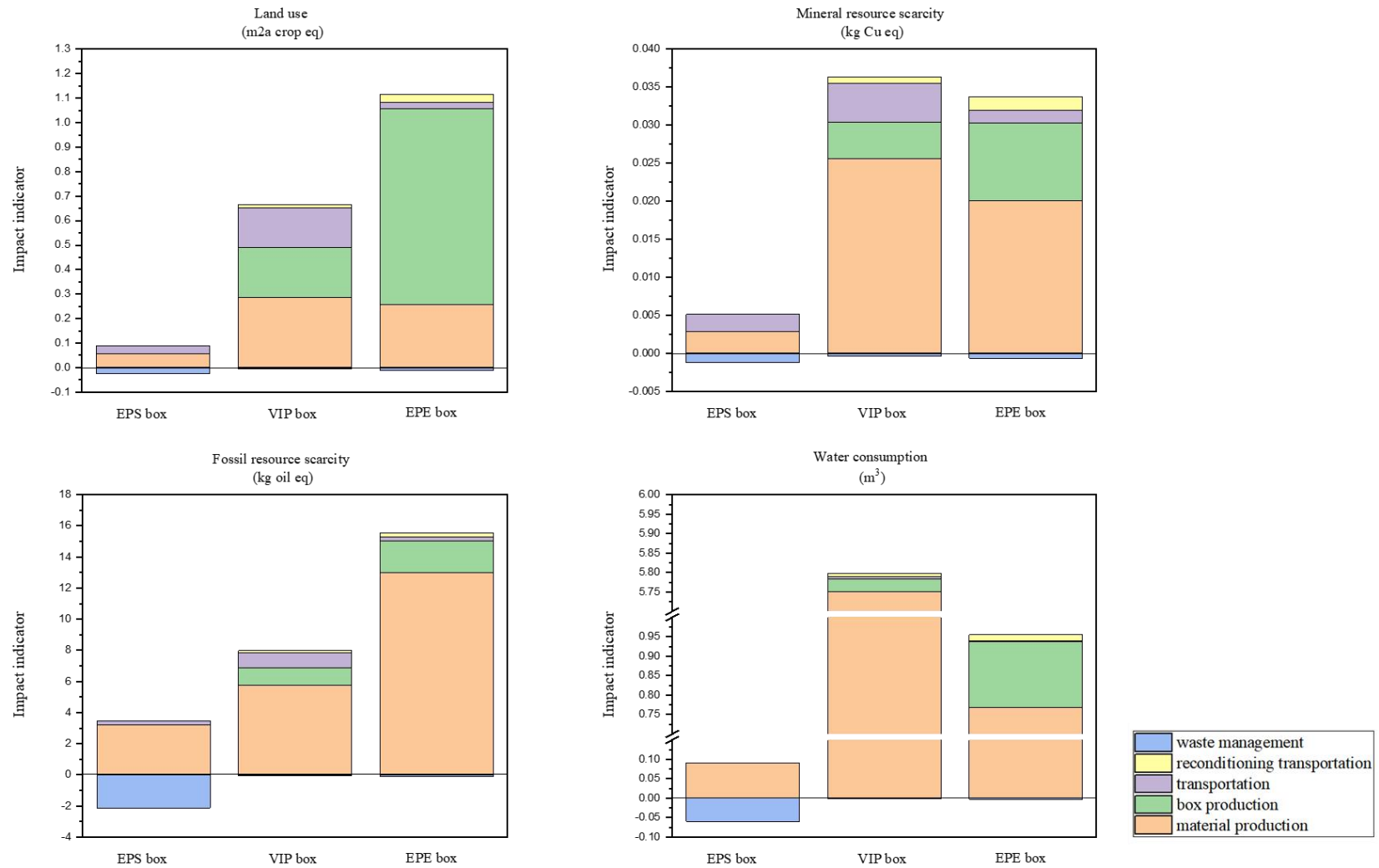


Figure S5. Potential impact results for scenarios 4 (1cycle).

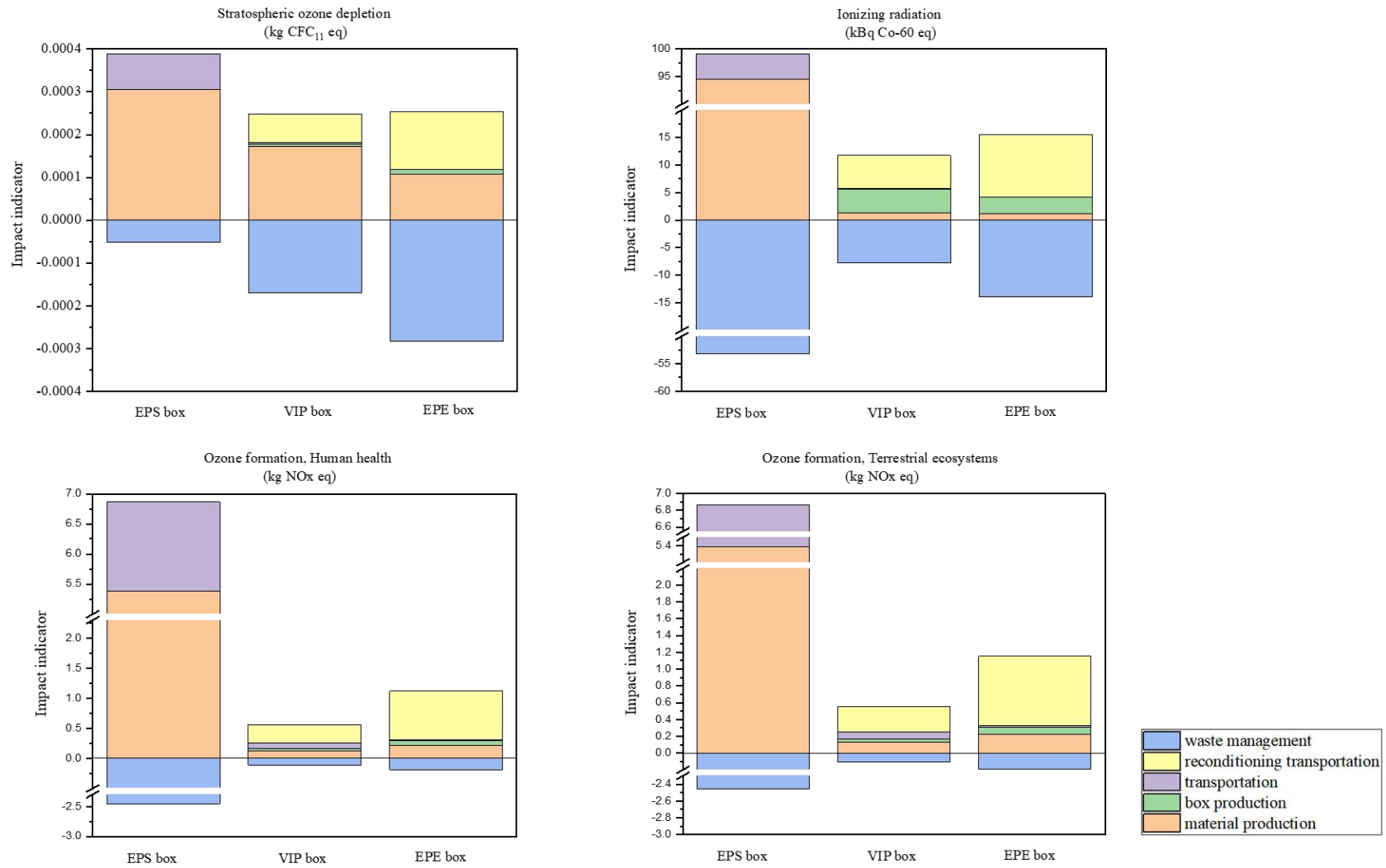


Figure S6. Potential impact results for scenarios 1 (300 cycle).

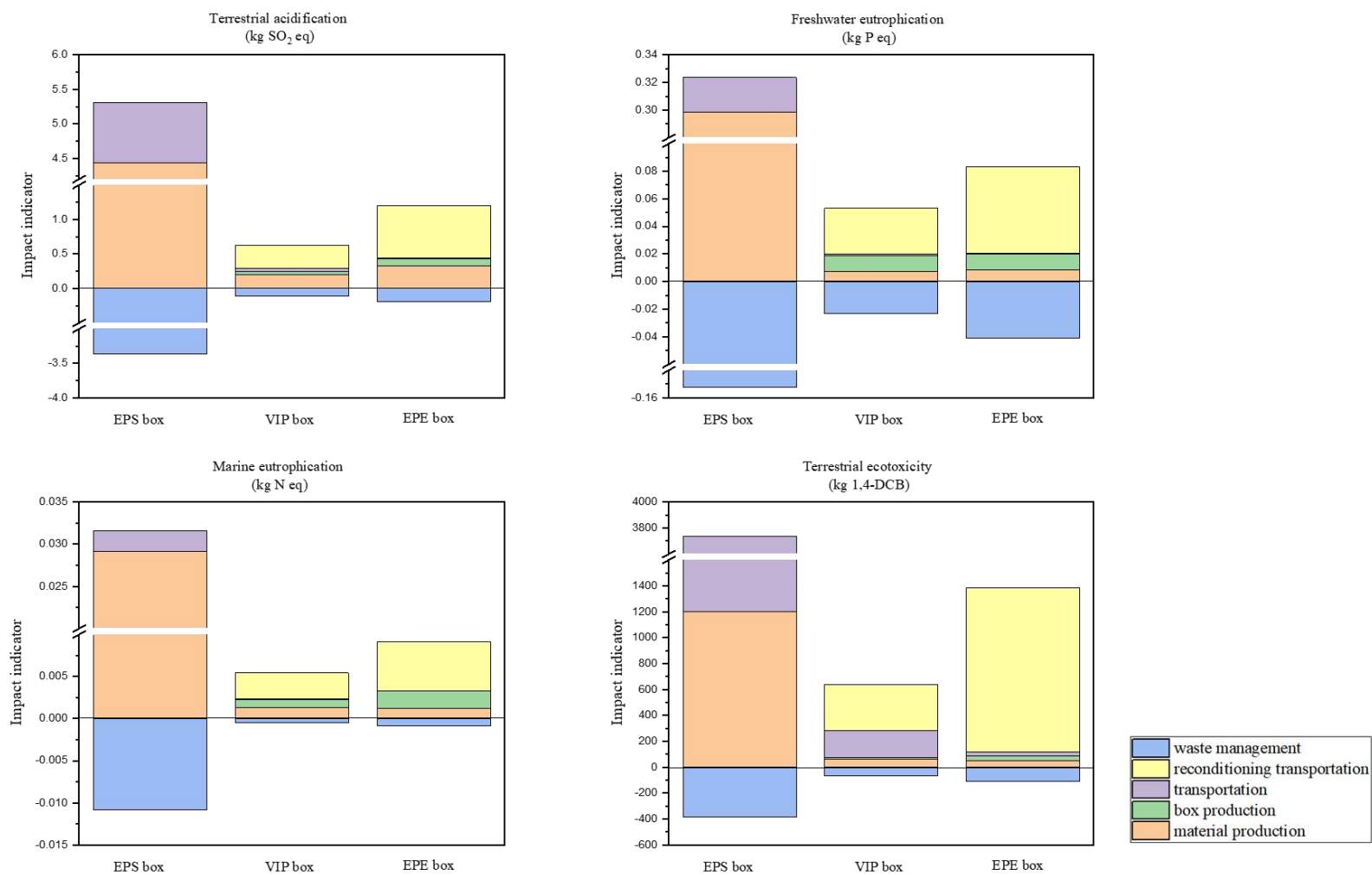


Figure S7. Potential impact results for scenarios 2 (300 cycle).

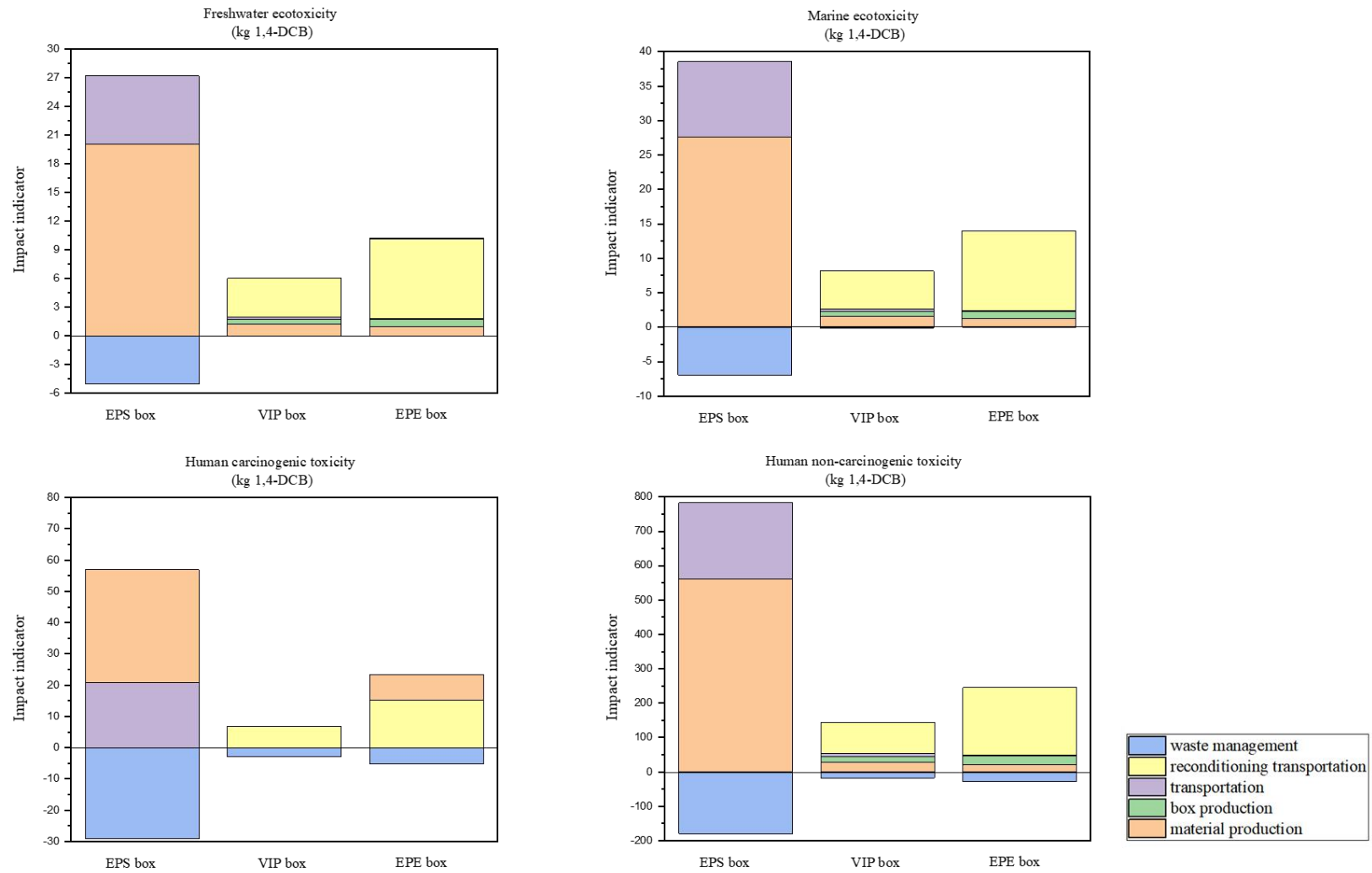


Figure S8. Potential impact results for scenarios 3 (300 cycle).

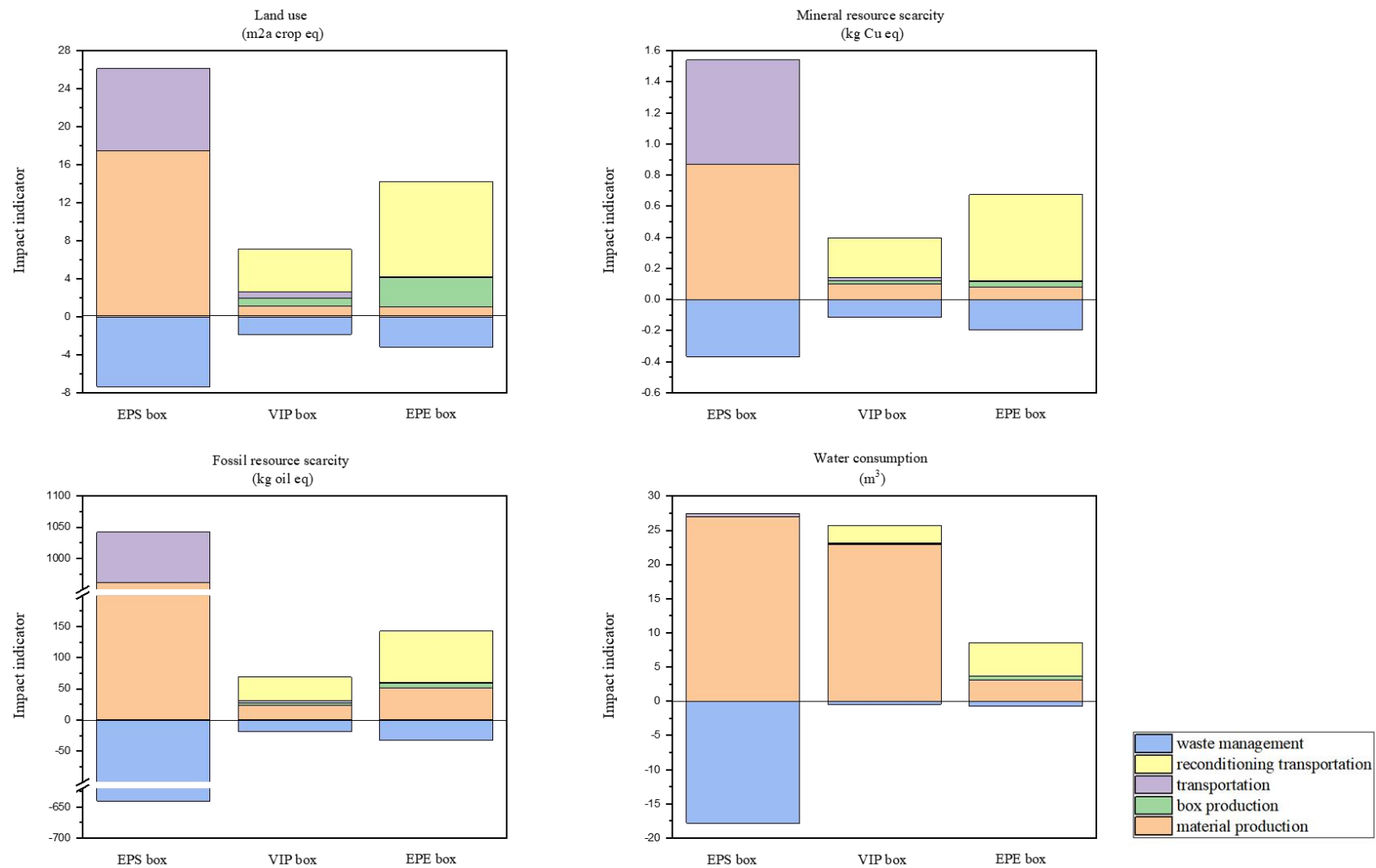


Figure S9. Potential impact results for scenarios 4 (300 cycle).

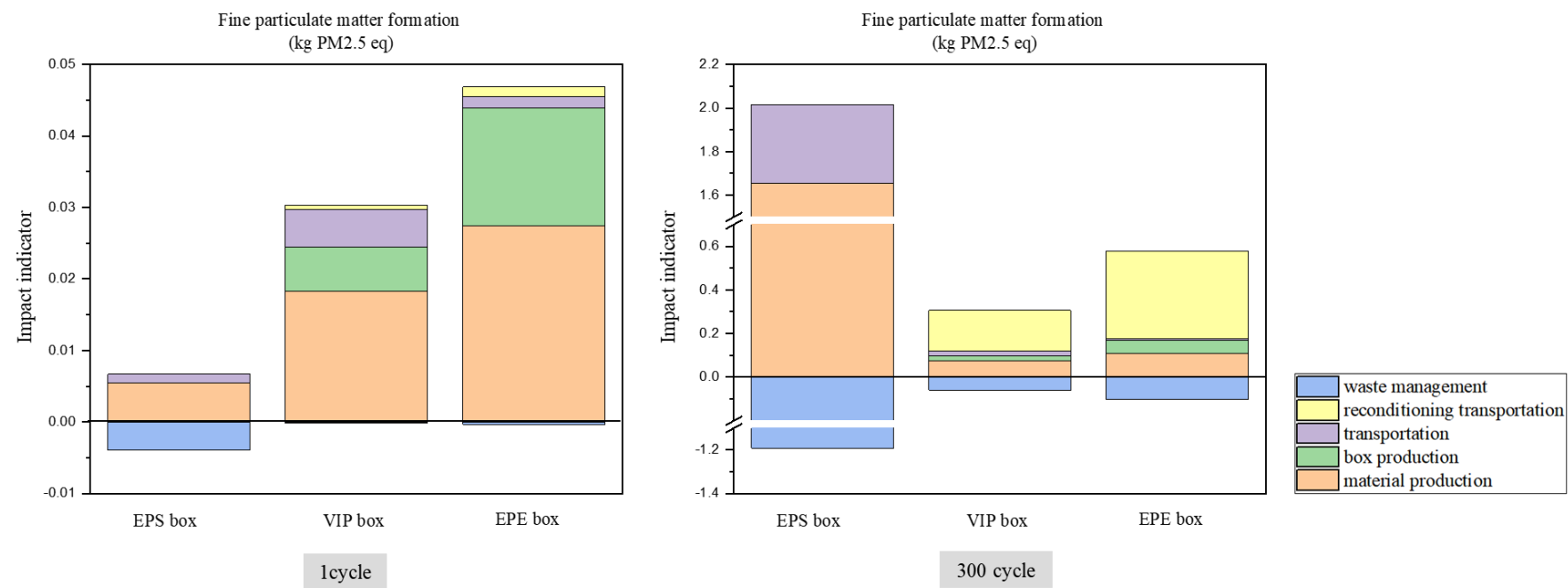


Figure S10. Fine particulate matter formation results for scenarios.