AD NET ZERO
ALL FOR NONE

Channel Emissions Framework and Formulae: TV / Video Extended Version

Phase	Step & sub-step		Physical processes involved	Formula type	Scaling factors	Expected materiality	Formulae		Accepted alternatives	Expected data hacks	Comments
CREATION	Tech Manipulation (Multivariant Creative)	Creative storage	Additional server storage for multiple volumes of assets for the purpose of distribution.	Digital service overhead	• Number and size of assets • Storage duration	Low	$\sum$ Number of assets	*(size of asset (kB) * time stored (yr) * carbon impact of storage[1] ($kgCO_2e/kB/yr$) * allocation factor for the campaign[2] (%))*	-	Not using this formula yet, as part of the storage is expected to be accounted with the server transmission formula of Ad creative delivery phase (simplification).	Additional storage impacts will be accounted for, however it is expected to be hard to isolate this type of data, therefore a generic formula was derived from the server formula; it is expected to be covered by a global server emission factor. In the future, this could also account for unused assets and multiple storage.
		Creative transcoding	Server processing for multiple volumes of assets for the purpose of distribution.	Digital service overhead	-	-	-		-	-	No formulas covers this specific topic. However for now a tweak has been included partially in the Ad Creative Delivery section.
DISTRIBUTION	Ad Space Selection	Creative Selection & Placement	Planning of creative to go on specific inventory within a marketplace	Corporate overhead	-	-	-		-	-	Included within corporate emissions overhead.
		Market-place: Buying – Direct	Proportion of advertiser & media owner's corporate emissions for buying process	Corporate overhead	-	-	-		-	-	
		Market-place: Buying – Indirect	Proportion of agency/ specialist & media owner's corporate emissions for buying process	Corporate overhead	-	-	-		-	-	
		Market-place: Buying – Programmatic/ Targeted/ Segmentable/Addressable	Servers processing transmission through SSP/DSP buying process	Use phase & embodied	Import from digital. See footnotes section for more information.						Programmatic formulas are to be imported from digital. However, values of defaults will be different. Addressable TV can rely on different protocols than Programmatic TV, however this has not yet been covered.
			Networks transmission through SSP/DSP buying process	Use phase							
				Embodied							
	Ad Creative Delivery	Transformation & Transfer – Linear broadcast (TNT/SAT)	Servers processing of ad delivery (broadcast)	Use phase	• Number of diffusions • Spot duration • Bitrate • Number of outputs	Low to medium	*Number of diffusions * Spot duration (s) * bitrate before transcoding (kB/s) * Number of media outputs[7] / Concurrent transcoding factor[8] * Redundancy factor * Infrastructure efficiency per data transferred including PUE (kWh/kB) * carbon intensity of electricity ($kgCO_2e/kWh$)*		-	-	Broadcast networks are supposed to be mobilized each type a diffusion of the spot is made.
				Embodied		Low to medium	*Number of diffusions * Spot duration (s) / average lifetime of infrastructure equipment (s) * EF Manufacturing and EOL of infrastructure equipment ($kgCO_2e$)*		-	-	
			Networks transmission of ad delivery (broadcast)	Use phase	• Number of diffusions • Spot duration	Low to medium	*Number of diffusions * Spot duration (s)* * $\sum$ Number of network type	*(consumption breakdown between countries of servers / users (%) * network energy intensity according to network type[6] and country (kWh/s) * carbon intensity of electricity ($kgCO_2e/kWh$))*	-	-	
				Embodied		Low to medium	*Number of diffusions * Spot duration (s)* * $\sum$ Number of network type	*(consumption breakdown between types of network (%) * EF manufacturing & EOL amortization networks according to network type[6] and country ($kgCO_2e/kB$))*	-	-	
		Transformation & Transfer – Linear multicast (IPTV)	Servers processing and networks transmission of ad (multicast)	Use phase & Embodied	Same as linear broadcast (see above).				-	-	The multicast mode is modelized similarly to broadcast for transmission (values used can however be different, e.g. efficiency of networks).
		Transformation & Transfer – Non-linear (& linear) unicast (CTV/OTT/ VOD...)	Servers processing of ad delivery (unicast)	Use phase	• Data transferred (kB) • Location	Medium to high	*Views * total server output data per view[3] (kB) * Number of media outputs[7] / Concurrent transcoding factor[8]* * $\sum$ Number of infrastructures	*(Breakdown of content delivered by ad servers vs. edge nodes[4] (%) * datacenter or edge nodes energy efficiency including PUE (kWh/kB output) * carbon intensity of electricity($kgCO_2e/kWh$))[5]*	-	• Total server output data per impression / Total data transferred on network per impression: For static format: file size proxy + payload overhead of additional as sets For video format: portion of file size loaded (incl. buffer) + payload overhead of additional as sets • Breakdown of content delivered by ad servers vs. edge nodes: Cache hit ratio of CDN can be a good lead	Conventional network model for digital networks.
				Embodied	• Data transferred (kB)	Medium to high	*Views * total server output data per view[3] (kB) * Number of media outputs[7] / Concurrent transcoding factor[8]* * $\sum$ Number of infrastructures	*(Breakdown of content delivered by ad servers vs. edge nodes[4] (%) * EF manufacturing and EOL of total relevant infrastructure ($kgCO_2e$) / infrastructure output bandwidth (kB/s) / average lifetime of infrastructure equipment(s))[5]*			
			Networks transmission of ad delivery (unicast)	Use phase	• Data transferred (kB) • Location	Medium to high	*Views * total data transferred on network per view[3] (kB)*				
							* $\sum$ Number of network type	*(consumption breakdown between types of network (%) * energy efficiency according to network type[6] and country (kWh/kB))*			
							* $\sum$ Number of infrastructures	*(consumption breakdown between countries of servers / edges nodes[4] and users (%) * carbon intensity of electricity ($kgCO_2e/kWh$))*			
				Embodied	• Data transferred (kB)	Medium to high	*Views * total data transferred on network per view[3] (kB)* * $\sum$ Number of network type	*(consumption breakdown between types of network (%) * EF manufacturing & EOL amortization networks according to network type[6] and country ($kgCO_2e/kB$))[5]*			
CONSUMPTION	Device Display	User device load	Download / stream of creative to the user device. Includes embodied emissions of devices.	Use phase	• Data transferred (incl. file size) • Device type	Low	*Impressions * Data transferred per impression[9](kB) / Broadband speed breakdown by country and by network type (kB/s)* * $\sum$ Devices[11]	*(Device mix (%) * Device power consumption to maintain active connection[10] (W))) * time conversion ratio (h/s) * carbon intensity of electricity ($kgCO_2e/kWh$)*	Load and render power of devices are expected not to be available, therefore the alternative is to account for full device power and lifecycle and not separate those two phases. Replace: *Device render power consumption* By : *Device total power consumption* Replace : *EF manufacturing & EOL amortization of devices, share of render* By : *EF manufacturing and EOL total amortization of devices* Device mix: Expected to be an average, for example yearly (unlikely to be a campaign based report).	Not using this formula yet (see opposite).	Time to load (s) is determined by the first two parameters. Short time is expected therefore materiality is expected to be low. However, it might become more material in time with on-device advertising is also identified as having a growing impact on loading, but is yet modelled, and it needs to be confirmed.
				Embodied		Low	*Impressions * Data transferred per impression[9](kB) / Broadband speed breakdown by country and by network type (kB/s)* * $\sum$ Devices[11]	*(Device mix (%) * EF manufacturing and EOL amortization of devices, share of connectivity[10] ($kgCO_2e$/unit) / total active used time over lifetime by device type (s of active use over full lifetime))*		Not using this formula yet (see opposite).	-
		User device render	Render and display of creative on the user device. Includes embodied emissions of devices.	Use phase	• Time displayed • Device type	High	*Impressions * Time displayed on device per impression(s)* * $\sum$ Devices[11]	*(Device mix by type and country (%) * Device render power consumption (W) * time conversion ratio (h/s) * carbon intensity of electricity ($kgCO_2e/kWh$))*		-	-
				Embodied		High	*Impressions * Time displayed on device per impression(s)* * $\sum$ Devices[11]	*(Device mix by type and country (%) * EF manufacturing & and EOL amortization of devices, share of render ($kgCO_2e$/unit) / total active used time over lifetime by device type (s of active use over full lifetime))*		-	-
ALL	Corporate emissions overhead		Allocated organizational emissions attributed to the specific campaign across ALL entities in the campaign value chain.	Corporate overhead	Campaign revenue	High	$\sum$ Number of assets	*Total relevant annual corporate emissions ($kgCO_2e$) * allocation factor for the campaign*	-	-	Every organisation in the value chain should be reporting their verified enterprise GHG emissions inventory annually to ensure reasonable data quality at the enterprise level. More guidance will follow on this in the next update of the GMSF.

Key

- = Not yet applicable or to be investigated further

$\sum$ = The mathematical sign for a sum

Footnotes for TV / Video

Tech Manipulation:

[1]Servers impact (that can be split by lifecycle phase) based on server type, efficiency and location (simplified formula).

[2]Storage of creative is likely to happen across multiple campaigns, therefore an allocation factor for the specific campaign being measured is needed and may be calculated as a percentage (%) either of revenue of the campaign / total revenue of the entity or campaign volume (e.g. impressions) / volume of all campaigns where the assets were used.

Ad Space Selection (Programmatic TV):

This unit operation is imported from the digital channel emissions framework and uses the same principles and theoretical formula as specified in the digital section.

Ad Creative Delivery:

[3]Ideally taking into account both:

- Real size of data transferred: For servers : Spot duration (s) x bitrate before transcoding (kB/s) ; for networks: Spot duration (s) x average bitrate of network (kB/s)
- Additional assets transmission

[4]Popular contents with the local host's user base are temporarily cached on edge nodes, therefore delivered from a local datacentre-like infrastructure (impact on carbon intensity of electricity).

[5]Sigma to account for different environmental performances of ad servers and edge nodes, as well as location for use phase and computing power for embodied emissions (different server models / configuration end in different emissions).

[6]Accounting for different performances of networks (e.g. fixed vs mobile, global vs local), as well as country. Edge nodes / CDN also allow to win on the network part (local delivery).

[7]For a single ad, there may be more than one version required for transcoding purposes.

[8]Factor taking into account simultaneous encoding of assets.

Consumption;

[9]Ideally taking into account both:

- Real size of creative file transferred: file size depending on user device / screen size, buffer settings, network quality...
- Additional assets transmission: scripts...

[10]Additional studies are needed to fully model difference of screen power (render) vs. active connection (load) so it is expected to be modelled globally.

[11]3 Devices list to be covered: any type of terminal that loads and displays video (TV, laptops, smartphones...), as well as extra set-top boxes / decoders equipment for modes that require them (especially linear broadcast / multicast modes).