

# Channel Emissions Framework and Formulae: TV / Video Extended Version

Phas e	Step & sub-step		Physical processes involved	Formula type	Scaling factors	Expecte d material ity		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	<ul> <li>Number and size of assets</li> <li>Storage duration</li> </ul>	Low	∑ Number of assets	(size of asset (kB) *time stored (yr) *carbon impact of storage¹ (kgCO2e/kB/yr) *allocation factor for the campaign² (%))	-	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	-	-		-	-	-		
			Direct	Proportion of advertiser & media owner's corporate emissions for buying process	Corporate overhead	· · · ·	-	-	- Included within corporate emissions overhead.				
		Market-place: Buying	Indirect	specialist & media owner's corporate emissions for buying process	Corporate overhead	-	-		-	-	-		
			Programma tic/ Targeted/	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	
			Segmentabl e/Addressa ble	Networks transmission through SSP/DSP buying process	Embodied			Import iro				Addressable TV can rely on different protocols than Programmatic TV, however this has not yet been covered.	
	Ad Creative Delivery	Transformatio n & Transfer	Linear broadcast (TNT/SAT)	Servers processing of ad delivery (broadcast)	Use phase	<ul> <li>Number of diffusions</li> <li>Spot duration</li> <li>Bitrate</li> <li>Number of outputs</li> </ul>	Low to medium	* Infrastructure ef * carb	Number of diffusions       * Spot duration (s)         * Spot duration (s)       * bitrate before transcoding (kB/s)         * Number of media outputs?       -         / Concurrent transcoding factor <sup>8</sup> -         * Redundancy factor       -         * Infrastructure efficiency per data transferred including PUE (kWh/kB)       -         * carbon intensity of electricity (kgCO2e/kWh)       -		-	Broadcast networks are supposed to be	
					Embodied		Low to medium	/ avera * EF Manufactur	Number of diffusions * Spot duration (s) / average lifetime of infrastructure equipment (s) * EF Manufacturing and EOL of infrastructure equipment (kgCO2e)		-		
				Networks transmission of ad delivery (broadcast)	Use phase	<ul> <li>Number of diffusions</li> <li>Spot duration</li> </ul>	Low to medium		Number of diffusions * Spot duration (s) (consumption breakdown between countries of servers	-	_	The multicast mode is modelized similarly	
								* <b>ک</b> Number of network type	/ users (%) * network energy intensity according to network type <sup>6</sup> and country (kWh/s) * carbon intensity of electricity (kgCO2e/kWh))				
					Embodied		Low to medium	*2	Number of diffusions * Spot duration (s) (consumption breakdown between types of network		-		
								Number of network type	(%) * EF manufacturing & EOL amortization networks according to network type <sup>6</sup> and country (kgCO2e/kB))				
			Linear multicast (IPTV)	Servers processing and networks transmission of ad (multicast)	Use phase & Embodied		:	Same as linear broadcas	t (see above).	-	-	to broadcast for transmission (values used can however be different, e.g. efficiency of networks).	
			Non-linear (& linear) unicast (CTV/OTT/ VOD)	Servers processing of ad delivery (unicast)	Use phase	Data transferred (kB)     Location     Data transferred (kB)	Medium to high Medium to high	* <b>S</b> Number of in frastructures	* total server output data per view <sup>2</sup> (kB) * Number of media outputs <sup>7</sup> / Concurrent transcoding factor <sup>8</sup> (Breakdown of content delivered by ad servers vs. edge nodes <sup>4</sup> (%) * datacenter or edge nodes <sup>4</sup> (%) * datacenter or edge nodes energy efficiency including PUE (kWh/kB output) * carbon intensity of electricity(kgCO2e/kWh)) <sup>5</sup> * total server output data per view <sup>2</sup> (kB)		<ul> <li>Total server output data per impression / Total data transferred on network per</li> </ul>	Conventional network model for digital networks.	
					Embodied			* <b>Σ</b> Number of infrastructures	* total server output data per view (kb) * Number of media outputs <sup>7</sup> / Concurrent transcoding factor <sup>8</sup> (Breakdown of content delivered by ad servers vs. edge nodes <sup>4</sup> (%) * EF manufacturing and EOL of total relevant infrastructure (kgCO2e) / infrastructure output bandwidth (kB/s) / average lifetime of infrastructure equipment(s)) <sup>5</sup>		For static format: file size proxy + payload overhead of additional as sets For video format:		
				Networks transmission of ad delivery (unicast)	Use phase	<ul> <li>Data transferred (kB)</li> <li>Location</li> </ul>	Medium to high	Views * to * ∑ Number of network type * ∑ Number of infrastructures	tal data transferred on network per view <sup>3</sup> (kB) (consumption breakdown between types of network (%) * energy efficiency according to network type <sup>6</sup> and country (kWh/kB)) (consumption breakdown between countries of servers / edges nodes <sup>4</sup> and users (%) * carbon intensity of electricity (kgCO2e/kWh))		<ul> <li>(incl. buffer) + payload</li> <li>overhead of additional as sets</li> <li>Breakdown of content delivered by ad servers vs. edge nodes:</li> <li>Cache hit ratio of CDN can be a good lead</li> </ul>		
					Embodied	Data transferred (kB)	Medium to high	Views * to * <b>∑</b> Number of network type	tal data transferred on network per view <sup>3</sup> (kB) (consumption breakdown between types of network (%) * EF manufacturing & EOL amortization networks according to petwork type <sup>6</sup> and country (kgCO2e/kB)) <sup>5</sup>				
CONSUMPTION		User device load		Download / stream of creative to the user device. Includes embodied emissions of devices.	Use phase	<ul> <li>Data transferred (incl. file size)</li> <li>Device type</li> </ul>	Low	Impressi / Broad	Impressions * Data transferred per impression <sup>9</sup> (kB) / Broadband speed breakdown by country and by network type (kB/s)			Time to load (s) is determined by the first two parameters. Short time is expected therefore materiality is expected to be low.	
								* ∑ Devices <sup>11</sup>	(Device mix (%) * Device power consumption to maintain active connection <sup>10</sup> (W))) * time conversion ratio (h/s) * carbon intensity of electricity (kgCO2e/kWh)	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	Not using this formula yet (see opposite).	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.	
	Device Display				Embodied		Low	Impressi / Broad	ons * Data transferred per impression <sup>9</sup> (kB) band speed breakdown by country and by network type (kB/s) (Device mix (%) * EF manufacturing and EOL amortization of devices.		Not using this formula yet (see opposite).		
								* Z Devices <sup>11</sup>	share of connectivity <sup>10</sup> (kgCO2e/unit) / total active used time over lifetime by device type (s of active use over full lifetime))			-	
		User device render		Render and display of creative on the user device. Includes embodied emissions of devices.	Use phase	<ul> <li>Time displayed</li> <li>Device type</li> </ul>	High		(Device mix by type and country (%)	consumption Replace : EF manufacturing & EOL amortization of devices, share of render By .	-	-	
								*∑ Devices <sup>11</sup>	* Device render power consumption (W) * time conversion ratio (h/s) * carbon intensity of electricity (kgCO2e/kWh))		Use full device power in the formula.	-	
					Embodied		High	Impression	s *Time displayed on device per impression(s)	EF manufacturing and EOL total amortization of devices	_	-	
								*∑ Devices¹¹	(Device mix by type and country (%) * EF manufacturing & and EOL amortization of devices, share of render (kgCO2e/unit) / total active used time over lifetime by device type (s of active use over full lifetime))	Device mix: Expected to be an average, for example yearly (unlikely to be a campaign based report).	Use full device EF in the formula. Total active used time ov er lifetime by device type is the result of daily use x lifetime in years	-	
АЦ	Corporate emissions overhead			Allocated organizational emissions attributed to the specific campaign across ALL entities in the campaign value chain.	Corporate overhead	Campaign revenue	High	∑ Number of assets	Total relevant annual corporate emissions (kgCO2e) *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  $\Sigma$  = The mathematical sign for a sum



## Footnotes for TV / Video

#### **Tech Manipulation:**

<sup>1</sup>Servers impact (that can be split by lifecycle phase) based on server type, efficiency and location (simplified formula).

<sup>2</sup>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:

<sup>3</sup>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

<sup>4</sup>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).

<sup>5</sup>Sigma to account for different environmental performances of ad servers

### Consumption;

<sup>9</sup>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...

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

<sup>11</sup>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).

and edge nodes, as well as location for use phase and computing power for embodied emissions (different server models / configuration end in different emissions).

<sup>6</sup>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).

<sup>7</sup>For a single ad, there may be more than one version required for transcoding purposes.

<sup>8</sup>Factor taking into account simultaneous encoding of assets.