**LLUVIAS PUNTUALES MÁXIMAS ACUMULADAS EN DÍAS
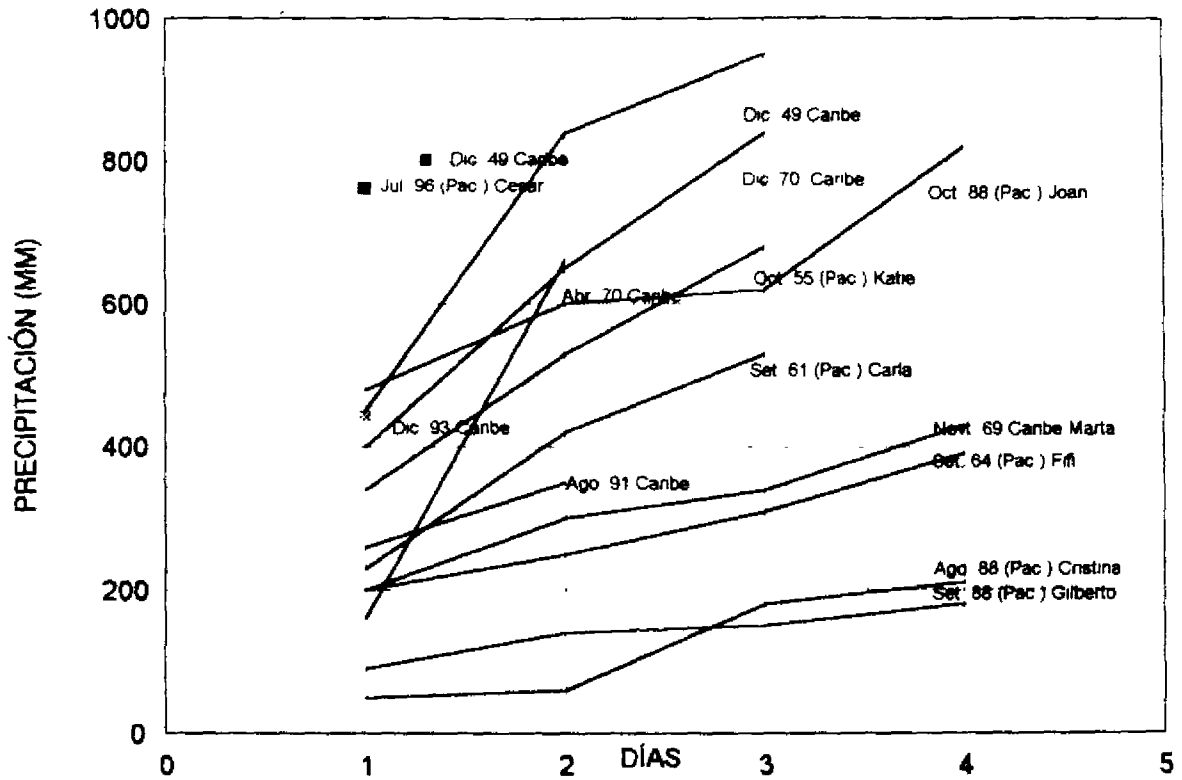SUCESIVOS PARA TEMPORALES QUE HAN AFECTADO COSTA RICA**

Figura No. 11

En la Figura No.12 se presenta una comparación de las envolventes de las intensidades máximas de precipitación de Costa Rica y el Mundo, donde se observa que los valores de precipitación para el Huracán César, en las estaciones de Bolivia y Aguas Buenas para diferentes duraciones superan las máximas intensidades registradas en el país, además, estos valores definen en mejor forma la envolvente de Costa Rica.

80

COMPARACION DE LAS ENVOLVENTES DE LAS INTENSIDADES
MAXIMAS DE PRECIPITACION DE COSTA RICA Y EL MUNDO
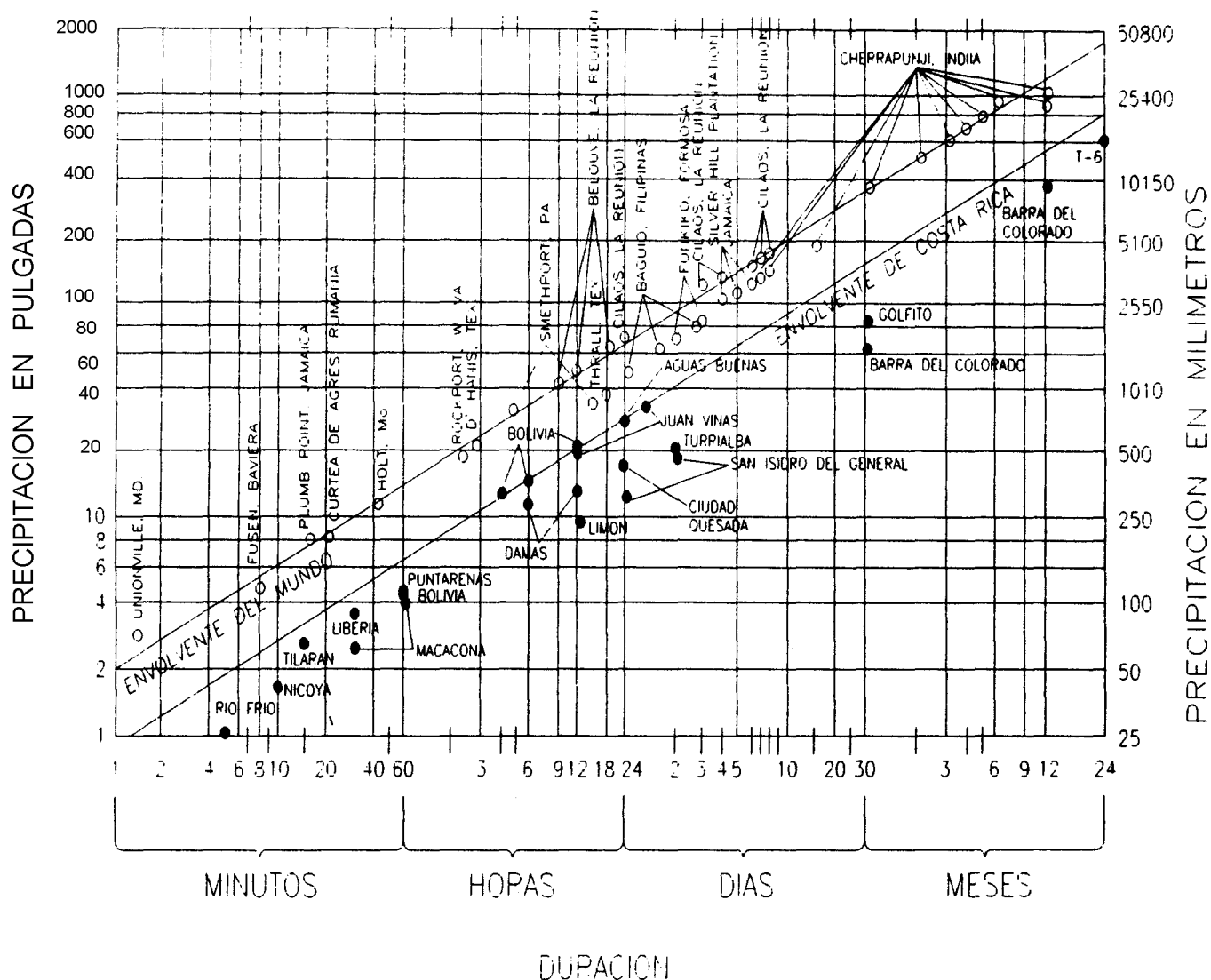

Figura No. 12

ACTUALIZADO :

Por: Lic. Sadí Laporte Molina y Sr. Frank Fernández M.

Octubre 1996
Digitalizó: Johnny Molina G.
Dpto. de Hidrología-ICE

En el Cuadro No.3 se muestran las intensidades máximas observadas de precipitación en Costa Rica.

INTENCIDADES MAXIMAS OBSERVADAS EN COSTA RICA				
ESTACION	AÑOS DE REGISTRO	PERIODO	PRECIPITACION EN MILIMETROS	FECHA DE OCURRENCIA
SAN JOSE	42	5 MINUTOS	20 6	20-05-1908
RIO FRIO	15	5 MINUTOS	25 4	JULIO 1998
NICOYA	13	10 MINUTOS	41 8	JULIO 1973
TILARAN	23	15 MINUTOS	63 0	AGOSTO 1981
MACACONA	9	30 MINUTOS	57	05-07-1915
LIBERIA	20	30 MINUTOS	87 7	SETIEMBRE 1983
MACACONA	9	1 HORA	95	20-08-1960
PUNTARENAS	24	1 HORA	118 8	SETIEMBRE 1974
BOLIVIA	27	1 HORA	114 0	22-07-1996
BOLIVIA	27	4 HORA	335 0	23-07-1996
DAMAS	12	6 HORAS	291 9	06-04-1995
BOLIVIA	27	8 HORAS	391 0	04 y 05-12-2949
JUAN VINAS	12	12 HORAS	504	04 y 05-12-2949
BOLIVIA	27	12 HORAS	560 9	27-07-1996
DAMAS	12	12 HORAS	349 7	06-04-1995
LIMON	8	12 HORAS	228 5	04-11-1962
SAN ISIDRO DEL GENERAL	20	1 DIA	280 1	13-10-1955
CIUDAD QUESADA	26	1 DIA	457 2	04-12-1949
AGUAS BUENAS	21	1 DIA	228 5	27-07-1996
JUAN VINAS	12	1 DIA 6 HORAS	838	04-05-12-1949
SAN ISIDRO DEL GENERAL	20	1 DIA 21 HORAS	477	12-13-10-1955
TURRIALBA	22	2 DIAS	476	04-05-12-1949
BARRA DEL COLORADO	12	1 MES	1628 7	AGOSTO 1948
GOLFITO	22	1 MES	2114 3	OCTUBRE 1954
BARRA DEL COLORADO	12	1 AÑO	8826 2	1952
T-6	2	2 AÑOS	14887 3	AGO 1962 - AGO 1964

Cuadro No. 3

Actualizó : Lic. Sadi Laporte Molina y Sr. Frank Fernández M.
Departamento de Hidrología _ ICE
Fecha Agosto de 1996

Análisis de los caudales

En el cuadro No.4 se muestran los caudales máximos instantáneos para la creciente del 27 y 28 de julio de 1996, originada por el Huracán César y los máximos registrados en el período de operación de la estación.

Caudal Máximo

ESTAC	NOMBRE	RIO	FECHA	HORA	ESCALA	CAUDAL	CAUDAL MEDIO	FECHA	CAUDAL REGISTRADO
01-01	Bratsi	Telire	28-07-96	9'04	4.53	1137	170	10-12-93	4730
01-02	Sixaola	Sixaola	28-07-96	22:27	6 09	1264	229	13-08-91	4090
02-02	Pandora	Estrella	28-07-96	18:30	3 14	205	40.9	01-08-96	1750
06-02	Barbilla	Barbilla	28-07-96	7'47	1 18	79 9	24 3	21-12-87	1040
06-06	Quebrador	Chirripó	28-07-96	11:58	4.48	1248	121	08-05-92	1990
08-01	Pacuare	Pacuare	28-07-96	9:00	2 49	132	32 6	09-04-70	1070
08-03	Dos Montañas	Pacuare	28-07-96	12'27	2 5	184	58 8	16-11-70	1520
09-03	Angostura	Reventazón	28-07-96	10 15	6.09	1050	102	09-04-70	3800
09-04	El Humo	Pejibaye	28-07-96	5:30	1 28	71 6	21.6	09-04-70	753
09-09	Oriente	Pejibaye	28-07-96	5'56	1 57	108	30.8	09-04-70	616
09-19	Palomo	Reventazón	28-07-96	4'53	4.23	632	34	19-06-84	593
09-22	Tapanti	Reventazón	28-07-96	6:00	4.72	609	10.8	10-12-93	275
09-24	La Troya	Navarro	28-07-96	6'40	2.95	222	7 94	11-10-90	302
09-26	Turrialba	Turrialba	28-07-96	7 00	1 56	32.9	3.94	01-09-83	301
09-27	Guayabo	Reventazón	28-07-96	ND	3.32	717	102	10-12-96	1390
09-39	Hamburgo	Reventazón	28-07-96	10:00	4.2	481	ND	ND	ND
14-17	Arenal Nuevo	Dos Bocas	28-07-96	7:00	1 08	5.74	1 07	28-07-82	39.4
14-23	Rugama	Q.Rugama	28-07-96	ND	1.15	6.77	6.61	04-10-91	133
14-25	R Chiquito	Chiquito	28-07-96	7:00	1.77	69.5	2.18	02-10-88	102
19-01	Guardia	Tempisque	28-07-96	1:00	6.67	584	25.1	27-10-60	2060
19-06	Coyolar	Colorado	28-07-96	5:00	1.97	43 9	4.02	18-09-74	371
20-01	Corobici	Corobici	28-07-96	12'25	1.33	75.7	48.8	14-10-55	914
20-03	Rancho Rey	Tenorio	28-07-96	12:13	3.82	260	9.01	18-10-79	1040
20-04	Tilarán	Santa Rosa	28-07-96	3'51	0 63	6.00	0.878	02-10-80	223
20-10	Magdalena	Magdalena	28-07-96	23:30	0.96	6.71	0 8	07-08-87	180
22-02	Guapinol	Barranca	28-07-96	6'26	3.36	339	10.2	11-10-90	1310
24-02	Tacares	Poás	28-07-96	10'59	1 71	77	11 7	13-10-55	271
24-06	Balsa	G. de Tárcoles	28-07-96	9'45	6 48	1010	75 7	24-11-69	1500
24-22	La Garita	Grande	28-07-96	9:25	4.82	519	34.1	16-09-89	665
24-23	Las Vueltas	Ciruelas	28-07-96	9:00	2.19	75 8	2 74	22-10-88	225
24-24	Nuestro Amo	Virilla	28-07-96	6'06	3 06	547	29 6	27-06-85	1060
24-26	La Caja	Tiribi	28-07-96	5 40	3.62	360	9.36	08-10-92	668
26-03	Bijagual	Parrita	28-07-96	7:45	5.17	2210	27 5	13-09-88	1260
28-01	Londres	Naranjo	28-07-96	4'30	4 40	1600	27 8	30-08-91	605
28-02	Los LLanos	Naranjo	28-07-96	5.00	5.42	770	13.8	26-10-93	164
29-03	S.P. Savegre	Savegre	28-07-96	14.30	5.05	ND	42.9	27-10-85	1510
31-01	Palmar	G. de Térraba	28-07-96	ND	8.61	13500 *	319	28-10-84	7480
31-03	El Brujo	General	28-07-96	ND	10 5	9050 *	172	2-08-73	4690
31-05	Las Juntas	Pacuar	28-07-96	ND	10.99	2630 *	21.7	08-10-73	902
31-07	Caracucho	Coto Brus	28-07-96	6:30	5.88	1780 *	70.5	13-10-86	1320
31-08	Rivas	G. de Térraba	28-07-96	ND	-	2083	22.4	13-9-88	597
31-09	La Cuesta	General	28-07-96	15 30	8.96	4690 *	62.8	22-10-88	2245
31-10	Pejibaye	G. de Térraba	28-08-96	ND	-	1170	6 38	08-10-73	1370

Cuadro No. 4

Nota : * Valores estimados.

El caudal en las estaciones que salieron de operación por la creciente, se estimó en base a Creagear, posteriormente se harán levantamientos hidrográficos en las secciones de las estaciones con el fin de estimar en forma más exacta el caudal. Como se puede observar en el cuadro No. 4 en las estaciones de las cuencas de Río Parrita, Naranjo, Savegre y Grande de Térraba, los valores de caudal provocados por el Huracán César superaron a los máximos históricos registrados. Además en las estaciones de Palomo y Tapantí se superaron los máximos.

En las figuras No. 13 a No.20 se presentan los hidrogramas de las avenidas provocadas por el Huracán César en algunas estaciones fluviográficas representativas de diferentes zonas del país, como son: Río Sixaola, Río Chirripó,

83

Río Pacuare, Río Reventazón, Río San Carlos, Río Tempisque, Río Grande de San Ramón y Río Coto Brus. Se puede observar que la creciente se produjo en las primeras horas del día 28.

AVENIDA DEL 27 Y 28 DE JULIO DE 1996-HURACAN CESAR
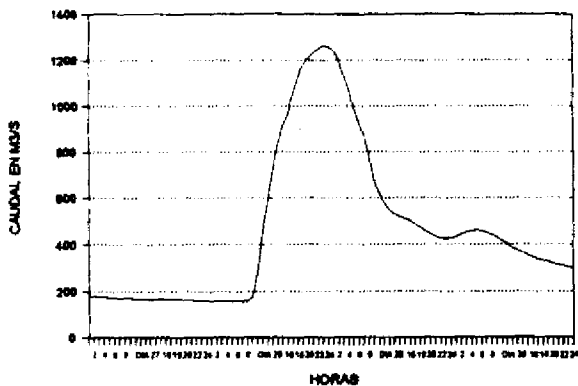ESTACION 01-02 SIXAOLA RIO SIXAOLA

Figura No. 13

AVENIDA DEL 27 Y 28 DE JULIO DE 1996-HURACAN CESAR
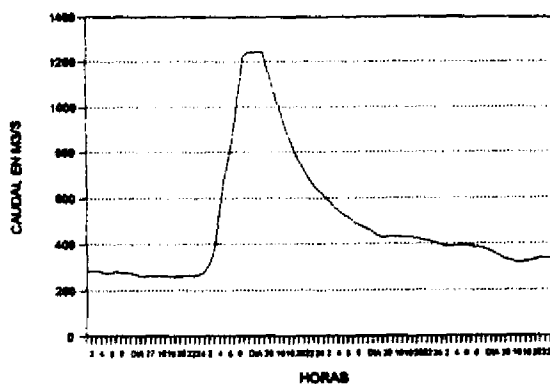ESTACION 08-06 QUEBRADOR RIO CHIRRIPO

Figura 14

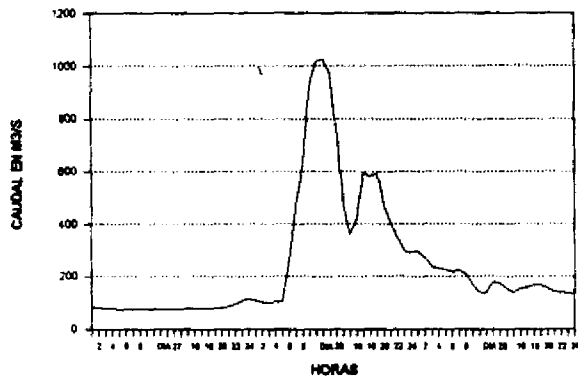AVENIDA DEL 27 Y 28 DE JULIO DE 1996-HURACAN CESAR
ESTACION 09-03 ANGOSTURA RIO REVENTAZON

Figura No. 15

AVENIDA DEL 27 Y 28 DE JULIO DE 1996-HURACAN CESAR
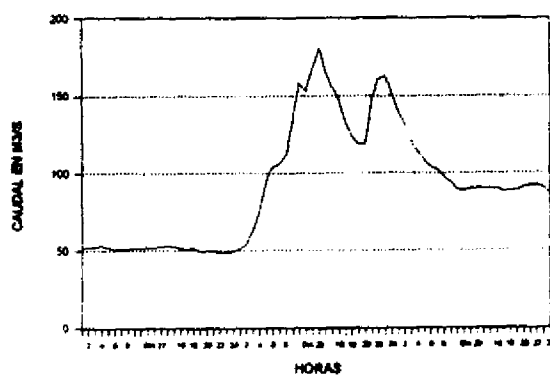ESTACION 09-03 DOS MONTAÑAS RIO PACUARE

Figura No. 16

AVENIDA DEL 27 Y 28 DE JULIO DE 1996-HURACAN CESAR
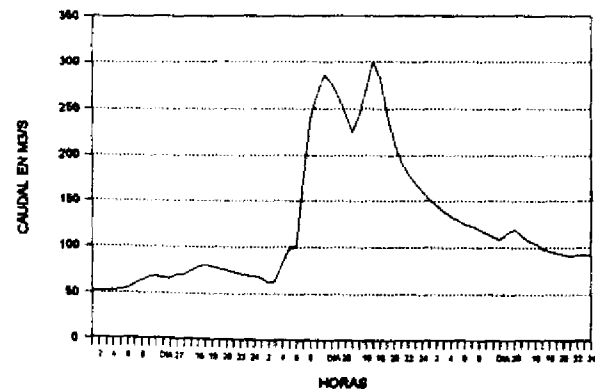ESTACION 14-02 JABILLOS RIO SAN CARLOS

Figura No. 17

AVENIDA DEL 27 Y 28 DE JULIO DE 1996-HURACAN CESAR
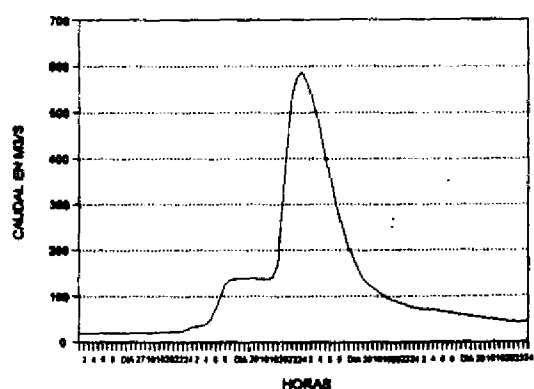ESTACION 19-01 GUARDIA RIO TEMPISQUE

Figura No. 18

84
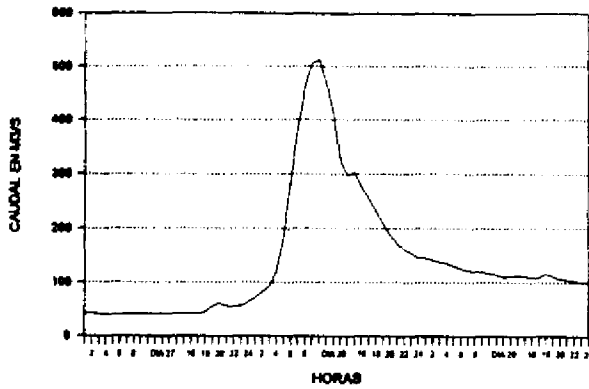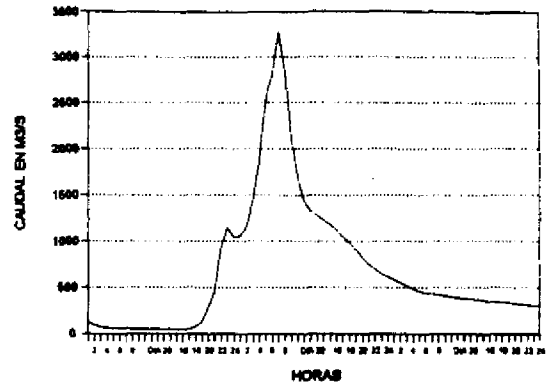
Figura No. 19

Figura No. 20

La cuenca de los ríos Grande de Térraba, Savegre, Naranjo y Grande de Candelaria, por efecto de la creciente se destruyeron y sufrieron daños en su estructura 16 estaciones fluviográficas, representando una gran pérdida económica para el Departamento de Hidrología del ICE.

En Cuadro No. 5 se presenta la lista de avenidas máximas registradas en Costa Rica, donde se observa que la creciente producida por el Huracán César, es el mayor evento de los últimos 50 años.

| PUNTO	RIO	SITIO	FECHA	CAUDAL m3/seg	C
1	Grande de Terraba	Palmar	20-10-54	10600 **	73
2	Grande de Terraba	Palmar	13-10-55	12000 **	85
3	Tempisque	Guardia	27-10-60	2060	54
4	Grande	Presa La Garita	06-09-61	577	10
5	Reventazon	El Congo	22-09-68	1610	24
6	Grande de Tarcoles	Balsa	24-11-69	1500	17
7	Virilla	San Miguel	25-11-69	2200	34
8	Tiribí	Electriona	25-11-69	1170	30
9	Grande de Tárcoles	Alumbre	25-11-69	3720	40
10	Pacuare	Siquirres	09-04-70	2920	51
11	Reventazón	Angostura	09-04-70	3800	47
12	Pejibaye	El Humo	09-04-70	753	32
13	Reventazón	Cachí	09-04-70	1300	22
14	Pejibaye	Oriente	09-04-70	616	19
15	Reventazon	Pascua	09-04-70	4260	47
16	Pacuare	Siquirres	10-04-70	2920 **	50
17	Naranjo	Londres	03-06-71	1030	33
18	Barranca	Nagatac	25-08-71	983	33
19	Parrita	Grande de Candelaria	29-10-71	2470	42
20	General	El Brujo	29-08-73	3290	31
21	General	Remolino	29-08-73	2660	36
22	Pacuar	Las Juntas	08-10-73	1350	34
23	Pejibaye	Pejibaye	08-10-73	1370	58
24	Rio San Carlos	Jabillos	20-10-74	1520	29
25	San Carlos	Terrón Colorado	20-10-74	3399	34
26	Arenal	Sangregado	20-10-74	655	13
27	Banano	Asunción	01-08-76	667	35
28	Corobicí	Corobicí	18-10-79	927	23
29	Blanco	Punta de Polo	18-10-79	323	14
30	La Estrella	Pandora	01-08-83	1750	31
31	Turrialba	Turrialba	01-09-83	301	17
32	General	La Cuesta	22-10-88	2245	34
33	Grande de Terraba	Palmar	22-11-88	10900	78
34	Telire	Bratsi	12-08-91	3520	35
35	Savegre	S.P. Savegre	27-10-85	1510	31
36	Reventazón	S.P. Guayabo	28-01-88	1220	14
37	Peñas Blancas	Peñas Blancas	13-12-94	994	26
38	Chirripo	Quebrador	13-02-96	3941	54
39	General	La Cuesta	27-07-96	4600	70.6
40	Reventazon	Tapanti A	28-07-96	600	20.8
41	Parrita	Bijagual	28-07-96	2210 **	48
42	Naranjo	Londres	28-07-96	863	27.5
43	Naranjo	Los Llanos	28-07-96	1110	42
44	Savegre	S.P. Savegre	28-07-96	3310	68
45	Gde. de Tarcoles	Palmar	28-07-96	13500 **	98.6
46	General	El Brujo	28-07-96	9050 **	84.5
47	Pacuar	Las Juntas	28-07-96	2630 **	66.1
48	Coto Brus	Cañucho	28-07-96	1780 **	23.6
49	Pirris	Tabacales	28-07-96	1250 **	37.1

Cuadro No.5

** Avenidas estimadas con base en levantamientos de las respectivas crecidas y con Creager.

C = Valor de Creager

En la figura No. 21, se muestran las avenidas máximas registradas en Costa Rica, mostrando la curva que corresponde a la constante de Creager.

86

AVENIDAS MAXIMAS REGISTRADAS EN COSTA RICA
DEPARTAMENTO DE HIDROLOGIA - I.C.E.
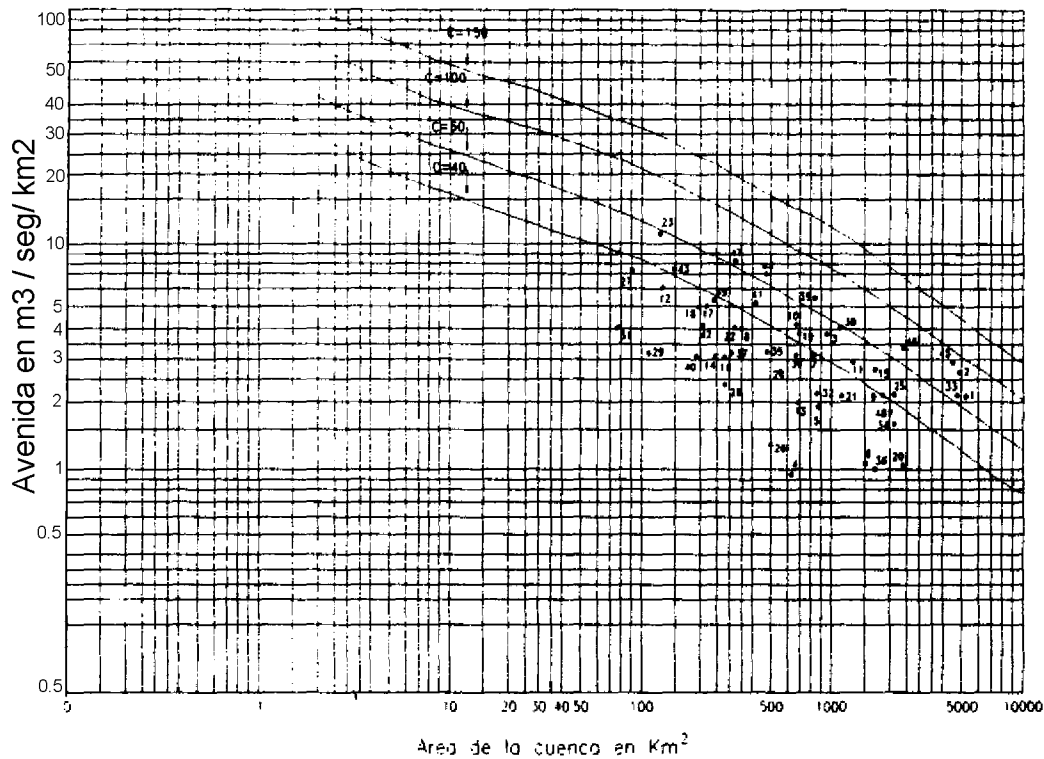
C= Curva que corresponde a la constante de Creager indicada

Figura No. 21.

En el cuadro No. 6 se muestran los caudales máximos registrados y estimados en la cuenca del Río Grande de Térraba para los huracanes Joan y César.

CAUDALES MAXIMOS REGISTRADOS Y ESTIMADOS
CUENCA DEL RIO GRANDE DE TERRABA

Estaciones	Río	Caudal Huracán Joan (m3/s) (22-10-88)	Caudal Huracán César (m3/s) (28-07-96)
31-08 Rivas	Chirripó	507	2083··
31-05 Las Juntas	Pacuar	1900·	2630··
31-09 La Cuesta	General	2245	5410··
31-10 Pejibaye	Pejibaye	730·	1170··
31-03 El Brujo	General	7400·	9050··
31-12 Cabagra	Cabagra	1270·	2574··
31-07 Caracucho	Coto Brus	1600·	1780··
31-01 Palmar	G. de Térraba	10900·	13500··

Caudales estimados por Area- pendiente

Caudales estimados por Creager

Cuadro No. 6

En el cuadrol No7, se presentan las avenidas extraordinarias en la Estación 31-01 Palmar, río Grande de Térraba.

AVENIDAS EXTRAORDINARIAS
ESTACION 31-01 PALMAR, RIO GRANDE DE TERRABA

Fecha	Escala (metros)	Caudal (m3/s)
Setiembre 1942	5.43	6607
Octubre 1949	5.71	7542
Octubre 1950	5.67	7301
Octubre 1950	5.85	7952
Setiembre 1953	5.07	5805
Octubre 1954 [1]	7.01	10686
Octubre 1955 [2]	7.51	12034
Setiembre 1971 [3]	4.72	4960
Agosto 1973 [4]	5.68	7300
Octubre 1984 [5]	5.2	6110
Octubre 1988 [6]	7.06	10900
Julio 1996 [7]	8.61	13500

Cuadro No. 7

(1) Huracán Hazel
(2) Huracán Katie
(3) Huracán Irene
(4) Temporal causado por el el paso de una depresión tropical
(5) Temporal causado por una vaguada de altura
(6) Huracán Joan
(7) Huracán César
Nota: Los datos de estas avenidas han sido estimadas por diferentes métodos.

Una estimación muy preliminar del hidrograma de caudal sólido (sedimento en suspensión) de la creciente originada por el Huracán César se estimó en 12 millones de toneladas de sedimento en suspensión.El total de sedimento en suspensión por año en la estación de Palmar es de 2,180.530.00 toneladas, como el promedio del período 1970-1992.

Conclusiones y Recomendaciones

* Las precipitaciones y los caudales producidos por el temporal del Huracán César fueron mayores que los del Huracán Joan.
* Las pérdidas materiales y humanas por efecto del Huracán César fueron de mayor cuantía en relación con el Huracán Joan.
* Con el Huracán César se registraron vientos del sur en toda la troposfera.
* El Huracán César rompió el nivel de intensidades de lluvia y de caudales de varias estaciones de la zona del Pacífico Sur y del país.
* Reforzar los estudios del grado de vulnerabilidad ante fenómenos naturales y los programas de educación sobre prevención de desastres.
* Mejorar las redes hidrometeorológicas usando telemetría.

Reconocimiento

A todo el personal del Departamento de Hidrología del ICE, el agradecimiento por la colaboracion en la recolección e interpretación de la información hidrometeorológica. También a la Sra. Mayela Chinchilla, Sr. Johnny Molina y al Bch. Luis Moreno por su labor de mecanografía y digitalización de las figuras.

Referencias

- Grandoso. Precipitaciones Intensas e Inundaciones en Areas Tropicales de América Latina, San Salvador, 1976
- Instituto Meteorológico Nacional. Boletín Meteorológico Mensual. San José Costa Rica, Julio de 1996
- Agustín Rodríguez. Estudio de las Avenidas de Diseño y Máxima Probable para el P.H Angostura. José Costa Rica 1984.
- Departamento de Hidrología ICE, Informe Hidrológico del P.H: Boruca, San José Costa Rica 1982.
- Laporte, P. Machado, Departamento Hidrología ICE. Informe de la Creciente de Diciembre 1993 en la Vertiente del Caribe de Costa Rica. San José Costa Rica, Enero 1994.

CONFERENCIA 6

Introduction

Many people feel a great distaste for politics. There is a certain level of resentment for the way the political process complicates rational decision making. However, politics is a part of all human endeavors. It is the means by which a group of people chooses what goals are important and how these goals will be achieved. Politics will not go away. We can, however, make the political process more transparent. This will serve two purposes: it will keep the political process as honest as possible, and it will ensure the participation of a maximum number of people in that process, thereby strengthening democracy.

The purpose of this presentation is first of all to explain one way public policy theorists view public policy. This approach is based on the policy process work of Anderson (1991). Other frameworks have been developed for analyzing public policy, such as group theory, institutionalism, and rational choice theory. All have their uses, but the policy process approach is especially appropriate because it allows us to focus on both actors involved in developing policy and on their interactions over time.

The second purpose of this presentation is to offer suggestions on some strategies that can be used to promote disaster mitigation policies in Costa Rica. These strategies are meant to spur your thinking and creativity as you confront this problem based on your knowledge of the national context.

The presentation is structured for non-political scientists. The first section covers the question "What is the political factor and why does it matter to us?" The second section covers policy process theory in some detail. This section is not meant to be memorized; it is meant to stimulate your thinking in political terms, so you can identify ahead of time actors and relationships that must be taken into account as you develop strategies and tactics for promoting disaster and development policies. Finally, the third section offers suggestions for action on disaster mitigation policy. This section will cover the application of the theories I present to disaster and development policy.

What is the "Political Factor"?

Politics has been defined in many ways, emphasizing different aspects of the concept. For our purposes the following definition is useful: politics is the "authoritative allocation of values." Politics is the process by which a society chooses what it values, allocates resources to these values, and uses the authority of the state to back the chosen allocations. In a democratic society, this process is relatively open, with many opportunities for different interests to be heard and influence the outcome. Professionals, technicians, educators, and employees of government institutions are among those interests, as are citizen groups and members of the government.

Politics can be seen in a systems perspective, as one of society's systems, embedded in the larger environment, with a set of inputs and outputs and a feedback loop (Easton 1957). Relevant environmental factors include institutional arrangements, socio-economic conditions, and political culture. A systems analysis allows us to examine who makes demands, what demands they make, and what kind of support they give to the system. It also allows us to examine the administrative decisions and laws that result from those demands. It does not explain the process by which the inputs are transformed into outputs, however. The next section will take us inside the black box to see what happens to turn inputs into outputs.

Inside the Black Box-The Policy Process

Public policy is defined as a "purposive course of action followed by an actor or set of actors in dealing with a problem or matter of concern" (Anderson 1994 p. 5). According to this definition, public policy is: purposive, not accidental; not a single action, but a course taken over time; is taken in response to policy demands; consists of what governments actually do, not what they say they will do; may be positive (action) or negative (regulation or neglect); and is authoritative because it is based on law.

The Policy Process figure shows one way of understanding what goes on inside the political system. Note first of all the spiral in the middle. It is messy for a reason. We should have no illusions about the policy process. It is not neat, and it is not linear. It does not consist of beginning at stage 1, progressing through stages 2, 3, and 4, and ending up at stage 5. These steps may occur simultaneously, even in a single policy area. There are no directional signs in the spiral, which means that policy can originate from the top (government) or the bottom (citizens).

Note that the process is cyclical, but it is not repetitive. Issues are revisited many times, but they change at each iteration, because the actors have changed and the society has changed, so the exact configuration of the debate will be different at each iteration. Although the steps may run concurrently, they are analytically distinct, and theoretically follow a logical order. We will now consider them in turn, offering some examples of how they relate to the policy areas of interest to us here today.

Agenda Setting

Agenda setting is perhaps the most important step of all. I will deal with this topic at some length, because many people do not realize its key role in public policy making. In the first place, it must be recognized that there are different agendas. The two basic types of agendas are the systemic, or informal agenda, and the institutional, or formal agenda (Cobb and Elder 1983, Kingdon 1984). The systemic agenda is the most diffuse, consisting of media attention and public attention to an issue. The governmental agenda is the "list of subjects to which governmental officials and those around them are paying serious attention" (Kingdon, p. 4). Both types of agendas exist at different levels of government, and can be further subdivided, into specialized agendas for different issues, or the "decision agenda" which is composed of the "list of subjects on the governmental agenda up for an active decision" (Kingdon p. 4). Putting an issue on the agenda is the first step toward the implementation of a coherent policy. Issues can be kept off the agenda for many reasons. There may be other, more apparently pressing issues before the nation. Powerful interests that favor the status quo can keep issues off the agenda (Bachrach and Baratz 1962), which is another way of making decisions.

From the agenda setting perspective, politics is about conflict. Every conflict consists of participants and an audience (Schattschneider 1960). The resolution of the conflict depends on the size of the audience (the scope of the conflict) and whose side they are on (the bias of the audience). Controlling these factors is one way to decide not only how conflicts are resolved, but what counts as a political issue at all. Increasing the scope of a conflict is a way to promote an issue on the political agenda. There is a great deal of competition for agenda space. The mass media can be used to help educate the general public about an issue, thus placing it on the informal agenda. It is more difficult to put an issue on the formal, governmental agenda, because the resources of the state are limited. It is important to develop good data on the issue to convince the politicians that it is an issue worthy of their time and attention.

Kingdon (1984) and Baumgartner and Jones (1993) emphasize the cyclical nature of agendas. Agendas are described as "punctuated equilibria" (Baumgartner and Jones 1993) in which a status quo level of attention to a specific issue is abruptly jolted to a different level, either higher or lower, which becomes the new equilibrium state. These changes are caused by mobilizations of enthusiasm or criticism. Media attention and government action are closely linked, but not in a simple one-way causal model. Rather, sometimes media attention prods the government to act, and sometimes government attention to an issue stimulates media attention. Critical periods of change can leave institutional legacies that "structure, influence and bias public policy outcomes for decades" (Baumgartner and Jones p. 251). Disasters are naturally cyclical events particularly susceptible to wide swings in media attention and

government action, which means that it is especially difficult to keep the issue alive long enough to develop and implement a coherent set of policies.

Policy Formulation

This step occurs together with agenda setting. As a problem is recognized, various solutions to it will be offered by different actors (Kingdon 1984, Anderson 1994). This is a more technical process than agenda setting. During this stage many ideas are considered as solutions to an identified problem. Although highly technical, the drafting of legislation is crucial to the success of the policy. Poor, hastily drafted legislation can have negative effects on the implementation and eventual results of the policy. There may be consensus on a policy or set of policies, or there may be conflict over potential solutions, even if there is consensus over the problem.

In general, the more technical the policy, the more likely it is to be passed through the legislative process with a minimum of conflict (Baumgartner 1989). Policy makers must always be aware that unforeseen complications may arise. Almost any policy creates some winners and some losers, and the losers can be counted on to widen the scope of the conflict if the policy appears to be disadvantageous to them.

Many authors have spoken of the "window of opportunity" that occurs in the lifetime of an issue (Kingdon 1984). In the case of disaster policy, this window occurs in the immediate aftermath of a disaster, when the society is most receptive to policy changes. Policy makers should have a course of action plotted and policy alternatives developed before the window opens, because public memories are short, and attention quickly shifts to another issue. As soon as the recovery from a disaster is well under way, legislators are less likely to be willing to risk promoting any specific policies. If there is consensus among the interested actors on a policy ahead of time, it is easier to marshall support for its passage before the window of opportunity closes.

Policy Adoption

This is basically the stage where a specific set of policies are adopted. It involves developing enough support for the passage of legislation, so it runs concurrently with the agenda setting and policy formulation stages. The way in which a government enacts legislation varies from one country to another, but in democracies, many different actors are involved.

These actors include the executive branch of government, legislators to shepherd the policy through the assembly, constituents to put pressure for the policy on the legislators, and the agencies that will be involved in administering the policy, as well as the ultimate recipients of the policy. Command rarely is possible in democracies; persuasion and bargaining are more likely to produce results. Policy advocates must persuade the relevant actors of the case for their policy. In a way, policy advocates must sell their ideas to the public and to the government. Bargaining involves linking several policies, as in the case where a legislature interested in passing one policy offers support for another legislator's policy, in order to gain the numerical majority needed to pass legislation. Policy adoption is simplified if the policy advocates can agree among themselves on what policies they wish to see enacted, and can pool their resources to follow a coherent strategy.

The issue of budgeting is a key to the success of an adopted policy. A policy without funding will become a dead letter. Policies should therefore be formulated and adopted with a full awareness of the fiscal constraints under which the system is operating. Fortunately, the most effective hazards mitigation methods are often not the most expensive ones For example, almost all rescues in disasters are made by victims themselves or by volunteers from the fringe of the impact area. Therefore, large expenditures on expensive Search and Rescue teams are not necessary. The community is better served by promotion of neighborhood emergency response associations. In many cases, the main problems in the immediate response phase are of coordination, not of availability of resources. Coordination requires building coalitions, an issue to which we will return later.

92

The implementation stage has been studied almost as much as the agenda setting stage (see for example Pressman and Wildavsky 1973, Lipsky 1980, Palumbo and Calista 1990, Wood 1991, 1992). Implementation is defined as those events and activities that occur after the policy is adopted. and which include the administration of the policy and its actual effects (Mazmanian and Sabatier 1983). Implementation is crucial because all policies are filtered through street-level bureaucrats. There is a tension between the clear directives needed to produce results consistent with the intent of the policy, and the freedom bureaucrats need to apply the policy in the varied situations they encounter. The policy environment changes over time, and a certain amount of bureaucratic discretion may be necessary.

Implementation is highly contextual. In the United States, implementation studies are heavily influenced by the federalist nature of the state, and strong state and local governments affect policy implementation. In a unitary system such as Costa Rica's, the system has a different vertical profile, but local actors will still be involved in implementation to some extent. These actors should be closely involved in the agenda setting, policy formulation and policy adoption stages, in order to ensure that implementation occurs in accordance with legislative intent.

The figure shows a model of policy implementation developed by Mazmanian and Sabatier (1983). This model is useful because it highlights specific variables and their interactions that produce varying levels of success in policy implementation. Three types of independent variables are included in this model. First is the tractability of the problem, or how easy it is to solve. Disaster mitigation and development are highly complex phenomena, and policies in these areas them are difficult to develop. Many policies have unintended consequences. Policy in these areas will probably rank high on the tractability dimensions, which will increase the difficulty of its implementation.

The second group of variables involves the ability of the statute to structure implementation. This is where statecraft and legislative skill are needed. The first two items, an adequate causal theory and clear and consistent objectives are both technical issues that must be addressed by the policy makers during the policy formulation stage. The third, adequate allocation of resources, is highly dependent on the fiscal resources available to the state at the time of policy passage. Items four through seven are items to be addressed during the crafting of legislative proposals. They cover the administrative regime under which implementation will take place.

The third set of variables affecting implementation are nonstatutory factors. The first is the socioeconomic condition of the country and the level of technology available to address the problem. These are more or less givens that policy makers have little opportunity to change. The level of public support for the policy tends to be cyclical, but can be increased by conscious efforts to keep it on the public agenda. The attitudes and resources of constituency groups as well as support from the state can be affected by coalition building activity. Finally, implementing officials need to develop high levels of managerial and political skills to ensure successful implementation.

The diagram shows that implementation itself consists of a number of items, both objective and perceptual. The first three outcomes determine how well implementation meets the requirements of the policy as legislated, and the last two cover society's evaluation of the policy.

The keys to effective implementation are: 1) clear and consistent enabling legislation, 2) a sound causal theory behind the policy, 3) the assignment of implementation to sympathetic agencies with sufficient resources to implement the policy, 4) skillful leadership of the implementing agencies, 5) active support by constituency groups and key governmental actors, and 6) a stable political and social environment. For example, there is a mandate for land use planning in Costa Rica (1), and we know that land use planning can be a valuable tool for the mitigation of the effects of natural disasters (2). Land use planning is not used as much as it could be, however, and the reason may lie in a lack of capacity on the part of the implementing bodies, or a lack of commitment to the use of land use planning (3, 4, and 5). Although the social environment of Costa Rica is stable (6), the frequent turnovers of political leadership can hamper the consistent use of any policy, including land use planning for the mitigation of natural disasters.

Policy Evaluation

There are two important points on policy evaluation. First, evaluation is not necessarily feedback. It becomes feedback if there is a means by which the results of the evaluation can be entered as inputs into the political system to demand change in the policy. Policies are evaluated continually in an informal fashion, without the evaluation yielding any change in policy. Second, evaluation mechanisms need to be built into legislation. This occurs during the policy formulation stage, when policy must be built on a clear causal theory, and clear objectives for the policy should be specified. Without these elements, it is very difficult to tell whether or not the policy is achieving the desired ends (Posavec and Carey 1992).

Strategies for Disaster Mitigation Policy Advocates

The material presented in this section is intended to be suggestive only. I am not an expert on Costa Rica, so you will have to judge whether the suggestions I offer have any applicability here. Given this, I offer these suggestions based on what I know about disasters, mitigation policy, and the policy process in general. Furthermore, these are very general strategies. I leave it to the audience to supply more specific tactics adapted to the Costa Rican context.

Four basic strategies will be covered: agenda setting, problem definition, policy linkage, and coalition building. These strategies refer to the stages of the policy process, but as I warned you, this is not a linear process. It is an iterative process, and involves what at times seems to be an overwhelming number of actors. Your task is to decide what are the relevant actors and get them involved in the process. Those who have a stake in a policy are more likely to work for its adoption and implementation.

Agenda Setting

It may strike some as strange to say that disasters need to be put on the agenda. After all, disasters are fascinating. The whole nation is glued to the television in the days following a disaster like Hurricane Cesar. The mass media descends on disaster sites in hordes, offering a mÄlange of useful information on shelter sites or emergency services and sensationalist coverage of rescue efforts and widespread damage. Up to 25% of the evening news coverage in the United States is on disasters (Ganz 1972). However, this type of coverage is not what emergency managers and disaster researchers want.

The informal disaster agenda is cyclical: the amount of attention rises and falls with each event. Disaster professionals, meanwhile, seek to foster planning and preparation for disasters, in the belief that "post-disaster relief, while humanitarian in its motivation and certainly necessary, is relatively ineffective as compared with various actions that could be taken before disaster strikes" (Rattien 1990). This requires a different sort of disaster agenda altogether.

During the immediate post-disaster period, a mobilization of public attention occurs. Disaster policy professionals might prefer to focus their efforts on mitigation and preparedness, but the media tends to ignore the more prosaic mitigation phase of disaster management, and is attracted by the drama of a disaster story (Scanlon 1973). Media attention focuses on the event itself, the response and to a lesser extent, the recovery phase. The enthusiasm of the response and recovery phases then gives way to a negative attention phase during which the true costs of disaster mitigation and preparedness become apparent. The negative side of disaster policy such as restrictions on development in floodplains and expensive preparedness measures comes to the fore, and public interest in addressing disasters with rational policy measures fades. These successive positive and negative mobilizations of attention can lead to an overemphasis on the least effective means of managing disasters, and divert funds from the more useful, but expensive and politically difficult phases of mitigation and preparedness.

Disasters can serve as focusing events that prod agenda setters to place the issue on the agenda. Problems fade from view because they have been successfully addressed, or because they appear intractable, so further attention is wasted on them. For example, once a disaster has passed the immediate dramatic phase of response and is well into the recovery phase, the media and public are ready to switch their attention elsewhere, allowing those affected by the event and policy makers to resume their activities under a less intense amount of scrutiny.

Contacts with the mass media are the key to keeping an issue on the informal, public agenda. Policy makers should cultivate these contacts, remembering that most reporters have no scientific background, so briefings must be given

in non-technical language. If contacts are maintained over the long term, you may be able to get stories in the media during non-disaster periods. One reason so much of the regular news coverage is devoted to disasters is their dependability: even on a slow day, some disaster is occurring somewhere. Policy advocates can use this fact to keep drawing attention to the issues involved.

All the attention that occurs during the immediate aftermath of a disaster can be seen as a "window of opportunity" for policy makers to press for passage of their policies. In order to take advantage of this window, however, it is important for the policy makers to have alternatives developed, ready for debate and if possible, passage. This can be difficult, as it requires a lot of research and money to develop action alternatives, and the money for this research and development is hard to get in the absence of a pressing, immediate need. Knowing that you are competing for money and attention with all the other issues is part of the battle, but a lot of creativity is required to keep disasters on the formal agenda even after they have fallen off the informal one. This relates to the second strategy: problem definition.

Problem Definition

Christopher Bosso's (1989) study of the role of mass media attention in the response to famine in Ethiopia in 1984 and 1985 showed how the President of the United States can be compelled by events, through media attention and consequent public pressure, to change his policy as an issue is redefined. Media attention to the Ethiopian famine first defined it as an endemic condition, and it was actually used by the Reagan administration as part of its policy to topple the pro-Soviet rulers of Ethiopia. At this stage, the famine was defined as a result of the corrupt Mengistu regime. This all changed when, by chance, film footage was made of starving Ethiopians at feeding stations. It still took a year for the U. S. news media to air the footage, but as soon as it was seen the issue exploded onto the informal agenda, and a redefinition of the problem occurred. Famine became a moral issue, a problem that the wealthy nations were obliged to relieve if they wished to retain their claims to world leadership. This problem redefinition forced a change in public policy toward Ethiopia, at least for a short while.

It has been said that "the definition of alternatives is the supreme instrument of power" (Schattschneider 1960 p.69). Attention is a limited commodity, and politics is shaped by what captures the public's attention. In order for an issue to get on the various agendas, it must be defined as a problem. An objective condition is only a problem if it has undesirable consequences for a significant proportion of the population (Jones 1975). It must be demonstrated that disasters have undesirable effects not only on the victims, but on the nation as a whole. Disasters must be redefined as long-term problems capable of solution. Some disasters cannot be prevented. but their effects can often be mitigated. When the human element in the causation of disasters is emphasized, we can move from a passive acceptance of the inevitable toward an engaged attitude which looks for areas in which the community can take responsibility for its fate.

A problem must not only produce dissatisfaction, but it must be seen as an appropriate area for government action. Problems are defined along many dimensions, such as causality, severity, incidence, novelty, proximity, and whether the problem is at a crisis state or not. In the case of disasters, the cause may be seen as "technological," or an "act of God." Severity, incidence, novelty, and proximity are all dimensions along which emergencies and disasters are often measured. A disaster is by definition a crisis state for a system.

Moreover, "not only are problems given descriptive definitions, so too are afflicted groups and individuals" (Rochefort and Cobb 1994 p.22). Groups can be defined as unfortunate and deserving victims of a disaster or as lazy and undeserving welfare recipients. In the first case, their concerns are more likely to merit government attention than in the second case. Populations affected by natural disasters can be characterized as hapless victims, passive in the face of overwhelming tragedy, or as active participants in the response to the event and in the recovery of their communities. It should be readily apparent which definition will produce more effective policies.

Policy Linkage

What I am talking about here is the effort to tie one issue to another, thus making a stronger case for both. For example, environmentalists have linked the preservation of biodiversity to economic development through the concept of sustainable development. In the same way, disaster specialists are now attempting to link hazard mitigation to economic development by pointing out the depressing effect expenses incurred for disaster recovery have on economic growth. This link has been made by CEPAL (1996) and Mora (1995). Other policy linkages could be made as well, for example, the public health consequences of a disaster range from threats to infrastructure such as clinics, to threats from injury and psychological damage.

Coalition Building

Common sense and scholarship are agreed that successful policy advocacy requires the cooperation of administrative and elected officials and private interests. The term "iron triangle" has been supplanted by issue networks, policy monopolies, and advocacy coalitions (Maas 1951, Heclo 1978, Baumgartner and Jones 1994, Sabatier and Jenkins-Smith 1993). The basic conclusion of these scholars is that in a democracy you can't just convince the president, you have to involve both official and unofficial participants: interest groups, political parties, research organizations, communications media, individual citizens. There is an element of marketing in this, as in agenda setting.

One key to building an advocacy coalition is discovering the incentive structure of the different participants. Administrative officials, as members of bureaucratic organizations, seek to expand the domain and budgets of their agencies. They are on the lookout for ways to link their agency's mission to the missions of other agencies, even to take over policy areas (Downs 1967). This tendency can be useful for building coalitions. There is a problem with coalitions that are too large, however. It becomes increasingly difficult to maintain cohesion in the coalition as its size increases. Some care should be exercised in choosing coalition partners.

In the same way, elected officials seek to expand their influence (Browne 1995). Politicians seek to perpetuate their political careers, even in a system, like Costa Rica's, which does not allow for reelection to office (Taylor 1992, 1995). According to Taylor, Costa Rican parties have been able to get politicians to deliver constituency service because, if the party is returned to office, the politicians have a chance to receive one of the coveted appointive positions in the executive branch. If hazard mitigation measures are desired by the voters of a politician's unofficial district, the politician can improve her party's image with the voters by delivering such measures, and help ensure her party's return to power, thus earning the gratitude of her party's leaders. This is admittedly a complicated chain of causation, involving selling the need for hazard mitigation to the voters, to the politicians, and to party leaders. It is an example of the sort of work required to show politicians it is in their interest to pursue the policies needed.

The other members of the hazards advocacy coalition are the academics, private citizens, business owners and others who are interested in promoting the issue and developing policies to address it. These individuals all have their own incentives for joining the coalition, and have things to offer the coalition. Private citizens have votes of their own, and have the power to organize and form pressure groups. Academics have the authority of their knowledge. Other examples can doubtless be thought of. The point is that these coalition members are valuable in their own right.

The different members of the coalition are joined through personal and public contacts such as this conference. Coalition building requires a lot of time and effort, and frequently is spearheaded by an individual who serves as the "champion" of the policy area, or by several individuals who devote a lot of attention to the issue. Finding such individuals and supporting their efforts is a key to the success of any advocacy coalition.

Conclusion

The differences between emergency management and hazard mitigation in "developed" and "developing" countries may not be as great as some people think. The same types of problems with coordination of resources and a lack of effective land use planning dominate disaster policy in the United States and Costa Rica. Resources are even more limited in Costa Rica, which makes a coherent set of policies even more important. There is a great deal of technical capacity available in the various institutions involved in response to and mitigation of natural disasters, and an impressive commitment to the reduction of the impacts of natural disasters and the promotion of a

sustainable model of development that does not increase vulnerability, but reduces it. Events such as the Workshop on Hurricane Cesar are an important first step to building an active coalition capable for the promotion of effective disaster policy in Costa Rica.

Opportunities for action occur within all the stages of the policy process, from agenda setting through policy formulation, adoption, and implementation to policy evaluation. The strategies of agenda setting, problem definition, policy linkage, and coalition building have been used successfully in the past to promote policy change. It is hoped that the ideas presented here will stimulate more awareness of the political possibilities and constraints before Costa Rica as it faces the challenge of natural disasters.

References

Anderson, James E. 1984. *Public Policymaking*. New York: Houghton Mifflin.

Baumgartner, Frank R. and Bryan D. Jones. 1993. *Agendas and Instability in American Politics.* Chicago: University of Chicago Press.

Baumgartner, Frank R. 1989. *Conflict and Rhetoric in French Policymaking*. Pittsburgh: University of Pittsburgh Press.

Bosso, Christopher. 1989. "Setting the Agenda: Mass Media and the Discovery of Famine in Ethiopia." *Manipulating Public Opinion*, M. Margolis and G. Mauser, eds. Pacific Grove, CA: Brooks-Cole.

Browne, William Paul. 1995. Cultivating Congress: Constituents, Issues and, Interests in Agricultural Policymaking. Lawrence, KS: University Press of Kansas.

Comison Economica para America Latina y el Caribe-CEPAL. 1996. Efectos de los Danos Ocasionados por el Huracan Cesar Sobre el Desarrollo de Costa Rica en 1996."

Cobb, Roger W. and Charles D. Elder. 1983. *Participation in American Politics: The Dynamics of Agenda-Building.* Baltimore: Johns Hopkins University Press.

Cohen, Michael, James G. March, and Johan P. Olsen. 1972. "A Garbage Can Theory of Organizational Choice." *Administrative Science Quarterly* 17: 1-25.

Downs, Anthony. 1967. *Inside Bureaucracy*. Rand Corporation.

Easton, David. 1957. "An Approach to the Analysis of Political Systems." *World Politics*, 9: 383-400.

Gey, Stephen G. 1993. "Lucas v. South Carolina and the Uncertain Future of the Takings Clause." *Environmental and Urban Issues*, 20,4:14-22.

Heclo, Hugh. 1978. "Issue Networks and the Executive Establishment." *In The New American Political System,* Anthony King, ed. Washington D.C.: The American Enterprise Institute.

Kingdon, John W 1984. *Agendas, Alternatives and Public Policies*. New York: Harper Collins.

Maas, Arthur A. 1951. *Muddy Waters*. Cambridge: Harvard University Press.

Mazmanian, Daniel and Paul Sabatier. 1989. *Implementation and Public Policy*. Lanham, MD: University Press of America

Mora, Sergio. 1995. "The Impact of Natural Hazards on Socio-Economic Development in Costa Rica." *Environmental and Engineering Geoscience* vol 1, 3: 291-298.

Moulton, Barbara. 1995. "Takings Legislation: Protection of Property Rights or Threat to the Public Interest?" *Environment,* March:44-45.

Platt, Rutherford. 1992. "Life After Lucas." *Natural Hazards Observer*, 17, 1: 8-9.

Posavec, Emil J. and Raymond G. Carey. 1992. *Program Evaluation: Methods and Case Studies.* Englewood Cliffs, NJ: Prentice Hall.

Sabatier, Paul and Hank C. Jenkins-Smith. 1993. *Policy Change and Learning: An Advocacy Coalition Framework.* Boulder, CO: Westview Press.

Scanlon, T. Joseph, Rudy Luukko and Gerald Morton. 1978. "Media Coverage of Crisis: Better than Reported, Worse than Necessary." *Journalism Quarterly* 55:68-72.

Schattschneider, E. E. 1960. *The Semisovereign People: A Realist's View of Democracy in America.* New York: Holt, Rinehart and Winston.

Singer, Saul J. 1990. "Flooding the Fifth Amendment: The National Flood Insurance Program and the 'Takings' Clause." *Environmental Affairs Law Review,* 17:323-370.

Skelton, Harold N. 1991. "Houses on the Sand: Takings Issues Surrounding Statutory Restrictions on the Use of Oceanfront Property." *Environmental Affairs Law Review,* 18:125-158.

Taylor, Michelle M. 1992. "Formal versus Informal Incentive Structures and Legislator Behavior: Evidence from Costa Rica." *Journal of Politics* 54, 4· 1052-1073

Taylor, Michelle M. 1995. "When Are Juridically Autonomous Agencies Responsive to Elected Officials? A Simulation Based on the Costa Rican Case." *Journal of Politics* 57, 4: 1070-1092.